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Initialled reviews and abstracts are by R. J. Garner, D. W. Goodall, R. V. Harris and H. Wormald of the East Malling Research Station.

INDEX OF CONTENTS.

MISCELLANEOUS.

Research generally.

1101. RUSSELL, J., AND OTHERS. 63: 581.08
Rothamsted 1843-1943, Rothamsted Experimental Station, Harpenden, 1943, pp. 60.
A review of the first hundred years of the oldest agricultural research station. The development and most startling discoveries of the different departments are discussed by various authors under the following headings: The experimental station 1843-1943, Soil physics, Soil chemistry, Soil microbiology, Botany, Plant pathology, Entomology, Bees, Insecticides and fungicides, Statistical science, Field experiments and crop physiology, The experimental farm.

1102. CRANE, M. B. 633/635-1.523
Cultivated plants of the past, present and future.
Endeavour, 1943, **2**: 111-6.
This survey deals chiefly with the origin of new forms through doubling of chromosomes, selection from the offspring of species crosses and species hybridization accompanied by chromosome doubling. Colchicine treatment and hybrid vigour are also among the subjects discussed.

1103. DRUMMOND, A. J. 551.574.4
The persistence of dew.
Quart. J. roy. met. Soc., 1943, **69**: 234-5.
The question of how long dew may be expected to be on short grass has only recently received much attention. Data obtained at Kew Observatory during 1942 show that out of 98 mornings on which dew had been reported at 7 h. G.M.T., in 65 instances it was still lying on the Observatory lawns two hours later. Really lengthy dews were experienced on 31 occasions, on 14 of which the grass was still wet as late as 13 h. G.M.T. On 26 mornings dew observed early had vanished by 7 h. G.M.T. The Kew observations strongly support the theory that in heavy dews the condensed water vapour chiefly comes up from moist soil.

1104. DELF, E. M. 582.6
Nature and uses of seaweeds.
Nature, 1943, **152**: 149-53.
Among uses noted are: as manure, as fodder either growing or cooked, as food or medicine, as a source of potash, and later of mucilaginous substances utilized in many ways, and as a source of agar.

1105. POLUNIN, N. 582.6: 631.8
Some proposals for the war-time use of plankton.
Chron. bot., 1942, **7**: 133-5.
Discussing various possibilities of using plankton, the author stresses his own suggestion that by watering from open tanks or pans during periods of great algal activity nutrient materials might be added to the soil. Adding a few drops of liquid manure to the water would increase the output of plankton if the tank were in a sunny position.

1106. COLQUHOUN, T. T., AND STEPHEN, V. A. 581.084.1
An air-conditioned experimental cabinet.
Reprinted from *J. Aust. Inst. agric. Sci.*, 1943, **9**: 77-80, bibl. 1.
An exact description with diagrams of the structure and mechanism of an improved experimental cabinet. A noticeable feature is that the air is not subjected to large temperature variations in localized areas, but to small variations over a large surface, following in part the system described by Wilson (*Ann. appl. Biol.*, 1937, 24: 911-31).

1107. MANSFIELD, B. P. 634/635
Some aspects of horticulture in New Zealand.
J. roy. hort. Soc., 1943, **68**: 223-8.
A brief account of the climate from the point of view of horticulture is followed by remarks on the native flora, the public parks and private gardens, the horticultural trade and the work of the Department of Agriculture and of the Institute of Horticulture.

1108. MURRAY, M. A., AND MUNNS, E. N. 634.985.5(7/8)
Possibilities of cork oak in the Americas.
Chron. bot., 1943, **7**: 323-7.
The cork oak being of Mediterranean origin requires mild winter temperatures and a comparatively low summer rainfall. Having studied climatic data for over 2,000 positions the authors suggest areas in North, South and Central America, where it could be grown successfully.

Soils and soil erosion.

1109. HARDY, F. 631.4(8)
The soils of South America.
Chron. bot., 1942, **7**: 211-7, bibl. 22.
The author brings together some information on South American soils. A rainfall and temperature map, a soil map and a vegetation map are given.

1110. DARRAH, W. C. 55(8)
A brief account of the geology of South America.
Chron. bot., 1942, **7**: 207-11, bibl. 10.
The article contains a new geological map of South America.

1111. LAMB, J., JR., AND CHAPMAN, J. E. 631.425: 631.459
Effect of surface stones on erosion, evaporation, soil temperature and soil moisture.
J. Amer. Soc. Agron., 1943, **35**: 567-78, bibl. 8.
Experiments conducted at the Arnst Soil Conservation Experiment Station and the Cornell University Experiment Station showed that a 65% stone cover, compared to the normal 18% stone cover, slightly reduced evaporation, increased water absorption, decreased soil loss and maintained a relatively high water-holding capacity; soil temperature was also increased. Stones are, therefore, best left on the ground unless they seriously interfere with cultivation. Tools such as the spring tooth harrow, that work stones to the surface, should be used and weeds controlled by toxic sprays. It is believed that the production of high quality grapes on steep stony slopes is partly due to high soil temperature under the stones.

1112. BROWNE, G. 631.459
Prevention of soil erosion by means of broad base terracing.
Farm and Forest, 1943, **4**: 29-33, bibl. 1.
A broad base terrace is an earth ridge or embankment, 10 to 12 ft. wide at the base, constructed across the slope of a field and having behind it a ditch of the same width designed to collect the water from the slopes above. The embankment and ditch have a gentle slope from the contour to carry off slowly to a chosen drainage channel such water as cannot be absorbed by the soil. The construction of such terracing is described and is based on an actual example laid out at the Daudawa Government Farm, Katsina Province, Northern Nigeria.

1113. CLOSE, A. M. 631.459
Soil erosion.
Rhod. agric. J., 1943, **40**: 193-8.
Principles of soil erosion control, based on experiences in India, which might be applied in South Africa. Comments on the technical problems raised are provided as footnotes by the Senior Conservation Officer.

1114. OSBORN, B. 631.459
The photographic transect.
Chron. bot., 1942, **7**: 262-3.
The method of evaluating the erosion-control values of different samples of plant cover by means of the photographic transect is described.

1115. COLVIN, W. S., AND EISENMENGER, W. S. 631.432: 581.9
Relationships of natural vegetation to the water holding capacity of the soils of New England.
Soil Sci., 1943, **55**: 433-46, bibl. 16.
The relative abundance of 62 plant species present in each of 10 soil water-holding capacity classes was determined at many widely scattered points in New England. The results are tabulated. The authors of the Massachusetts Agricultural Experiment Station conclude that the maximum water-holding capacity of the soil is a factor in the distribution of some plants. The natural vegetation of an area may, therefore, serve as an indication whether a certain crop can be grown without risking drought or excessive moisture.

Growth and growth substances.

1116. BURSTRÖM, H. 581.144.2
Studier över rottillväxtens mekanism. **(Investigations on the growth mechanism of roots.)** (English summary 1 p.)
K. LantbrAkad. Tidskr. Stockh., 1942, **81**: 257-72, bibl. 4.
This paper is a condensation of 4 papers by the author published during 1941 and '42 in different Swedish journals and quoted in the bibliography. The main subjects dealt with are: Properties of the cell under normal conditions of cell elongation, the significance of carbohydrates in cell division and cell elongation, the effect of heteroauxin on cell elongation and the co-operation of carbohydrates and hormones in the growth process.

1117. BROYER, T. C., AND HOAGLAND, D. R. 581.144.2
Metabolic activities of roots and their bearing on the relation of upward movement of salts and water in plants.
Amer. J. Bot., 1943, **30**: 261-73, bibl. 17.
Experiments carried out at Berkeley, California, have produced data which oppose the idea that either the absorption or translocation of salt necessarily depends on absorption of water or transpiration. Other factors of a metabolic nature may be associated with increased water absorption. For instance, even if the plants are illuminated and subjected only to differential humidity in the atmosphere, their internal reactions may be altered apart from water loss. A brief explanation is given of the process of salt absorption and movement. It is shown how a condition of root pressure ensues in young barley plants which is directly associated with salt accumulation and that the upward movement of salt dissolved in a solution (reflected in exudates) more concentrated than that of the external medium must be considered. The salt as it comes in contact with living cells of the shoot can be accumulated by active cell processes as it is by root cells. Transpiration, especially with a large intake of water, will dilute the upward moving salt solution, but that the metabolically governed processes of salt movement in the root are thereby lessened in importance is not to be accepted, and they may be determinative. It is agreed, however, that the role of transpiration in upward movement is not excluded but there is no necessary proportionality between salt and water absorbed.

1118. MAGISTAD, O. C., AND REITEMEIER, R. F. 581.11: 581.14
Soil solution concentrations at the wilting point and their correlation with plant growth.
Soil Sci., 1943, **55**: 351-60, bibl. 20.
Among the data obtained from a collection of 17 different soils were measurements of osmotic pressure and soil conductivity in relation to plant growth. It was found that crop growth diminished if the osmotic pressure exceeded 4 atm. and the conductance value exceeded 1,200. At values above 40 atm. and 3,000 conductivity plant growth failed. Normally fertile irrigated soils had a soil solution concentration at wilting percentage of 1·3-1·8 atm., conductance values ($K \times 10^6$) of 200-350, 2,000-4,000 p.p.m. and 30-50 m.e. per litre of salts. The investigations were carried out at the U.S. Regional Salinity Laboratory, Bureau of Plant Industry.

1119. KRISHNA IYENGAR, C. V. 581.14: 635.64
Fluctuation in the weight of a plant.
Curr. Sci., 1943, **12**: 188-9, bibl. 3.
Investigations on the tomato plant carried out at the Intermediate College, Mysore, revealed that the daily oscillations in plant weight coincide with the upward and

downward movement of the leaves. Although the plant showed an increase in weight from day to day, it lost weight every morning till about 11 a.m. (new time). The leaves changed the direction of their movement at about the same time. The author holds that leaf movements are caused by fluctuation in turgor indicating a variation in water content. Thus the movement of the leaf may be taken as an indirect expression of the fluctuating weight of the plant.

1120. D'Oliveira, M. de L. 631.847
As nodosidades das leguminosas. **(The root nodules of the *Leguminosae*.)**
Rev. agron., Lisbon, 1942, **30**: 345-413.
A review of present knowledge. Many authorities are quoted, but without exact references.

1121. Zimmerman, P. W. 577.15.04
Present status of "plant hormones".
Reprinted from *Industr. Engng Chem. (Industrial edition)*, 1943, **35**: 596-601.
The purpose of this paper [presented before the Division of Fertilizer Chemistry at the 104th meeting of the American Chemical Society, Buffalo, N.Y.] is to list the most important physiologically active substances discovered to date and to discuss some of their practical applications which have been reported from or verified at the Boyce Thompson Institute laboratories. Phenoxy and benzoic acids substituted in the nucleus with halogen, methyl, and nitro groups have opened a new line of attack on plant hormone problems. Phenoxyacetic acid is slightly active for cell elongation but does not induce formative effects of growing plants. When substituted in the ortho and para positions, the resulting dichloro-phenoxyacetic acid is effective, causing cell elongation, adventitious roots, parthenocarpy and formative effects. *p*-chlorophenoxyacetic is less active than the dichloro, and the ortho compound is less active than the para. Bromo-substituted compounds are slightly less active than the chloro. 2, 4, 6-tribromophenoxyacetic acid is inactive, but 2, 3, 5-triiodobenzoic acid is very active. The higher homologs, such as chlorophenoxy-α-propionic and chlorophenoxybutyric acids, are active for cell elongation and adventitious roots but not very active for formative effects. Benzoic acid is physiologically inactive until substituted with halogen or nitro groups. 2-chloro-5-nitrobenzoic acid is inactive for cell elongation but is active for modifying the pattern of leaves. 2-bromo-3-nitrobenzoic acid is active for both factors. Considering the increased activity of substituted phenoxy and benzoic acids over phenoxy and benzoic acids, the activity of many other substances in the hormone field might be increased by this method. The principal uses for growth substances are to propagate plants from cuttings, prevent pre-harvest drop of apples, induce seedless fruit (especially tomatoes), and inhibit buds (especially buds of potato tubers). Flowering of plants can be regulated to some extent with the most active compounds. Treatment of seeds with growth substances to increase the crop has not been effective. [Author's summary.]

1122. Melin, E. 577.15.04
Växthormoner och deras betydelse. **(Growth hormones and their significance.)**
K. LantbrAkad. Tidskr. Stockh., 1941, **80**: 413-21.
A survey of our present knowledge of the effect of growth hormones on cell division and cell growth.

1123. Stoutemyer, V. T. 631.535: 577.15.04
The influence of substituted groups in some plant growth substances on rooting responses of cuttings.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 365-8, bibl. 3.
Marked differences in rooting response were obtained when slight changes were made in composition or structural configuration of growth substances with certain shrubby plants (*Cornus, Pyracantha, Ligustrum* and others). Some definite groupings of plants may be made on the basis of varying response in root formation with various compounds. The addition of methyl, hydrogen and isoprene groups in various positions on a growth substance did not interfere with its promotion of root formation and in some cases seem definitely to have improved it.

1124. Lundegårdh, H. 577.15.04
Om tillväxtstimulering genom heteroauxin, aneurin (vitamin B_1) och jästextrakt. **(Stimulation of growth by heteroauxin, aneurin (vitamin B_1) and yeast extract.)** [German summary.]
K. LantbrAkad. Tidskr. Stockh., 1943, **82**: 99-122, bibl. 154.
In re-examining contradictory results on the activity of hormones the author comes to the conclusion that the effect of heteroauxin, aneurin and yeast extract on seeds of cereals is too small to warrant such treatment in agricultural practice.

1125. Zimmerman, P. W. 581.13: 581.04
Studies at Boyce Thompson Institute involving the effects of gases on growth of plants.
Chron. bot., 1942, **7**: 206-7.
Two continuous air flow chambers with attached Thomas autometers were erected in a greenhouse at the Boyce Thompson Institute in order to study the effect of gases liberated by industrial activities. Ethylene causes epinasty of the tomato leaf in concentrations of either 1: 1,000 or 1: 100,000,000. Acetylene and propylene induce a response at a concentration of 1: 100,000, carbon monoxide at 1: 50,000. Acetylene, propylene and carbon monoxide seemed to have effects on plant growth identical with those known to be produced by ethylene, provided they are present in much higher concentrations. There was no evidence that plants were ever damaged by sulphur dioxide prevailing in the atmosphere. Lucerne grown for periods up to 25 days in a sulphur dioxide concentration of 0.10 or 0.20 p.p.m. compared favourably with the controls. Lucerne and buckwheat leaves were spotted if subjected to a concentration of 0.40 p.p.m. of sulphur dioxide or chlorine for 7 hours, but some species do not suffer from a 7-hours' exposure to a 1.0 p.p.m. concentration. The order of toxicity on green leaves was Cl_2-SO_4-HCN-NH_3-H_2S.

Photosynthesis.

1126. Spoehr, H. A., and others. 581.13
Research on photosynthesis at the Laboratory of the Carnegie Foundation of Washington.
Rep. Stanford University, 1941, from extract *Chron. bot.*, 1942, **7**: 176-7.
The authors are engaged in working out a new hypothesis of photosynthesis necessitated by their recent observations. They found:—(1) the efficiency of photosynthesis to be 1/10 to 1/12 instead of 1/4, (2) the photosynthetic quotient to vary, (3) many living cells to reduce carbon dioxide in the dark, or at least to incorporate carbon dioxide into pre-existing organic compounds. Other observations pertain to the possible role in the photosynthetic process of other pigments besides chlorophyll and to the influence of light on the respiratory process. In further investigations certain diatoms are being studied which appear to be aberrant in the compounds formed in photosynthesis, and radioactive carbon is being used.

1127. Watson, E. V. 581.4
The dynamic approach to plant structure and its relation to modern taxonomic botany.
Biol. Rev., 1943, **18**: 65-77, bibl. 113.
Following a historical introduction the modern dynamic approach to plant structure in morphological and anatomical investigations is described and the position with special

reference to the taxonomy of the angiosperms is discussed. An ultimate synthesis will have to be found in taxonomy between the search for absolute truth and the practical necessity of maintaining a workable convenient system.

1128. HARRIS, D. G., AND ZSCHEILE, F. P. 581.174
Effects of solvent upon absorption spectra of chlorophylls *a* and *b*; their ultraviolet absorption spectra in ether solution.
Bot. Gaz., 1943, **104**: 515-27, bibl. 30.
Solutions of chlorophyll *a* in 13 solvents and of chlorophyll *b* in 5 solvents were measured spectrophoto-electrically in the visible region and the absorption spectra are reported. Spectra for the ultraviolet region being of minor importance for photosynthesis, they were only determined for solutions in ethyl ether. Some general principles are discussed. The investigations were conducted at the Purdue University Agricultural Experiment Station.

1129. SMITH, E. L. 581.144.4: 581.192
The chlorophyll-protein compound of the green leaf.
Chron. bot., 1942, **7**: 148-9, bibl. 7.
The article is a brief account of work on the chlorophyll-protein compound. The chlorophyll protein ratio was found to be 16: 100, corresponding to a chlorophyll content of 3 molecules of chlorophyll *a* and 1 of chlorophyll *b* for the Svedberg protein unit of 17,500. It is suggested that this may represent a definite combining ratio of *a* and *b* in the protein molecule. The effect of detergents such as digitonin, bile salts, and sodium dodecyl sulphate was studied. With the two first named detergents and sodium desoxycholate the chlorophyll was separated from the protein and the protein itself showed a sedimentation constant (S_{20}) of $13{\cdot}5\times10^{-13}$, equivalent to a molecular weight of 265,000 as calculated from Stokes' law. It is thought that magnesium plays no part in binding chlorophyll to the split protein fragments, but may be concerned in the combination with the larger units. Carotenoids have always been associated with the chlorophyll, but could not be separated. Although the significance of the chlorophyll-protein compound cannot be described it must be regarded as of greatest importance for photosynthesis.

1130. SINGH, B. N., AND ANANTHA RAO, N. K. 581.17
State of chlorophyll in the chloroplast.
Curr. Sci., 1942, **11**: 442-3, bibl. 3.
Fluorescence of chloroplasts of *Phaseolus vulgaris* colloidally dispersed in water ceased when trypsin or lipase was added. Colloidal suspensions of lecithin chlorophyll showed fluorescence, while chlorophyll sol added to lecithin sol or chlorophyll sol added to lecithin solution did not show any fluorescence. Taking also previous results of other workers into consideration the authors believe their findings to point to the possibility that in the chloroplast the chlorophyll may be dissolved in a lipoid which is colloidally dispersed over the proteinaceous groundwork of the chloroplast leading thereby to an intimate association with both protein and lipoids. The experiments were carried out at the Benares Hindu University.

Nutrition.

1131. ARNON, D. I. 631.8
Mineral nutrition of plants.
Annu. Rev. Biochem., 1943, **12**: 493-528, bibl. 71.
Certain aspects of the mineral nutrition of plants as revealed by papers in the past year are discussed under the following headings:—(1) *Absorption and accumulation of ions*, including effects of hydrogen ion concentration on plant growth. (2) *Interrelations and functional aspects of nutrient elements*, including drift in plant composition, aspects of nitrogen metabolism, reciprocal relations of elements, high salt effects in plants, inorganic nutrients in relation to fruitfulness and nutritional quality of plant products. The latest work on diagnostic methods of assessing nutrient deficiencies and the present status of micronutrient elements is also noted.

1132. EATON, F. M. 663.61: 581.084.1
Sand culture methods.
Chron. bot., 1942, **7**: 200-1, bibl. 9.
Latest developments in the technique of sand cultures in the laboratory, outdoors and in the greenhouse are described.

1133. ROBINSON, W. O. 631.416.8+581.192
The occurrence of rare earths in plants and soils.
Soil Sci., 1943, **56**: 1-6, bibl. 6.
Comparatively large quantities of rare earths ranging from 3 to 2,296 p.p.m., were discovered accidentally by the author in hickory leaves. Hickory trees from granite and gneiss soils, which are highest in rare earth content, absorbed rare earths in such quantities that the ash of their leaves contained somewhat more than 2·5%. The highest rare earth content found in soils was over 0·16%. The analysis of hickory leaves may serve as an indication of the amount of available rare earths in the soil. So far, rare earths have been found in all plants and soil samples examined, and exchangeable rare earths were found in the 12 soils tested.

1134. POLLARD, A. G., SMITH, C. W. R., AND ROWE, L. R. 631.346: 631.423
Soil studies at Wisley. Part III. The flower-pot, the soil, and the plant.
J. roy. hort. Soc., 1943, **68**: 271-5.
In a previous paper the authors had reported (*ibidem*, 1943, 68: 239-42; *H.A.*, 13: 853) that the flower-pot removes part of the soluble nutrients from the soil. Further investigations at Wisley attempt to determine whether the nutrient salts accumulate in the pot walls owing to chemical attraction of the salts by the pot material or as a deposit of evaporation through the pores. Another phenomenon studied was the attraction of roots to the pot walls. By analysing new and used pot materials it was found that the pot walls contain nutrient salts in soluble form, which could be extracted by water as well as transferred to compost if the latter was mixed with crushed pot material. This explains why plants seem to thrive better in old pots. It has some bearing also on pot washing, discouraging the use of acids for this purpose, since analysis proved that acids remove a very much larger amount of salts from the pot than water. When the outside of a pot was waxed, thus preventing evaporation but leaving the inside free to absorb nutrient salts—if such a chemical process takes place—the roots accumulated only slightly at the pot walls. When the inner surface was waxed also the roots did not mat at the wall at all. In a pot half waxed the roots spread only at the unwaxed wall part. When a plant in a small pot was placed in a bigger pot the roots grew through the drainage hole into the bigger pot and massed there at the walls. All these observations are thought to suggest that the concentration of nutrient salts in the pot wall (1) is caused by evaporation, (2) is responsible for the massing of roots in that region. Plants grown in glass pots for 85 days were very much inferior in weight and appearance to plants in clay pots owing to a much smaller concentration of soil solution in the first. Probably lack of aeration prevented bacterial activity. Roots in glass pots spread evenly through the soil, showing no preference for the wall.

1135. BUSHNELL, J. 633.491-1.85
The possibility of reducing the proportion of phosphate in fertilizer applied to sandy soils.
Amer. Potato J., 1943, **20**: 153-5, bibl. 8.
Soil tests at the Ohio Agricultural Experiment Station revealed about 200 lb. of available phosphorus per acre, a figure probably just above the threshold value. The potato fertilizer tentatively recommended under such conditions is 1,000 lb. of 8-4-12, which can be obtained by mixing 500 lb. of 0-8-24 with 375 lb. of sulphate of ammonia

or its equivalent of any nitrogen fertilizer. Soil tests, preferably by Truog's method, should be carried out wherever an excess of phosphate is suspected, chiefly as an economy measure.

1136. JOSHI, K. G. 631.849
The nature and fertilising value of phosphorus in sewage.
Curr. Sci., 1942, **11**: 465-6.
In experiments carried out at the Indian Institute of Science, Bangalore, application of sewage gave better response than an equivalent dosage of nitrogen in a soil deficient in phosphoric acid. Application of phosphorus to this soil increased the yield as well as the phosphorus content of the plants. Six tables give detailed results of analyses and a fractionation of sewage and sludge, of the response of various crops to different treatments and of sewage farm soils.

1137. DICKINSON, D. 581.192: 546.27
The chemical determination of minute amounts of boron.
A.R. Fruit Vegetable Pres. Res. Stat. Campden for 1942, 1943, pp. 18-26, bibl. 9.
The determination of traces of boron by means of the quinalizarin reaction is quite a good method, and considerable time may be saved by using alkaline solutions of phenolphthalein and thymolphthalein to match the colours, thus eliminating the preparation of rather troublesome standards. The colour is not an easy one to match, however, and the personal factor is of first importance. The use of alizarin-S in place of quinalizarin offers several advantages. In the first place the colour change is such that it can be matched by a single solution, methyl-orange, as the depth of the column of solution required to match the colour produced by the alizarin-S and boron is a direct measure of the amount of boron present. Secondly, the colour is so much less intense and so much easier to match that the personal factor is almost eliminated, and the results are more nearly reproducible. Much of the material included in this paper has already appeared in the *Analyst*. [Author's summary.]

1138. TIPPO, O. 581.9
A modern classification of the plant kingdom.
Chron. bot., 1942, **7**: 203-6, bibl. 5.

YARNELL, S. H. 631.523: 581.02
Influence of the environment on the expression of hereditary factors in relation to plant breeding.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 398-411, bibl. 86.

HERCHENRODER, M. V. M. 319: 63
A review of modern practical methods of analysis in statistics.
Rev. agric., Maurice, 1943, **22**: 51-68.

DAUBENMIRE, R. F. 581.9(712)
Vegetational zonation in the Rocky Mountains.
Bot. Rev., 1943, **9**: 325-93, bibl. 175.

NAYAR, M. R., AND SHUKLA, K. P. 631.415.3
Permeability and hydrolysis of sodium soils.
Curr. Sci., 1943, **12**: 183-5, bibl. 2.

SHUKLA, K. P., AND NAYAR, M. R. 631.415.3: 631.432
An equation for the percolation of water in sodium-calcium soils.
Curr. Sci., 1943, **12**: 155-6.

DULEY, F. L., AND DOMINGO, C. E. 631.432
Reducing the error in infiltration determinations by means of buffer areas.
J. Amer. Soc. Agron., 1943, **35**: 595-605, bibl. 6.

TAYLOR, J. K., AND STEPHENS, C. G. 631.459
Note on the mapping of soil erosion.
J. Coun. sci. industr. Res. Aust., 1943, **16**: 33-6, bibl. 1.

WALSH, T. 631.452
Soil fertility studies. Part II. The assessment of soil fertility.
J. Dep. Agric. Éire, 1942, **39**: 277-306, bibl. 17.

DACHNOWSKI-STOKES, A. P. 631.878
The moss peat situation in relation to national emergency needs.
Chron. bot., 1942, **7**: 245-7.

CHILDS, E. C. 631.62
Studies in mole-draining. Interim report on an experimental drainage field.
J. agric. Sci., 1943, **33**: 136-46, bibl. 5.

FAIRBANK, J. P., AND MINGES, P. A. 631.8: 631.34
An accurate fertilizer applicator for field test plots.
Proc. Amer. Soc. hort. Sc. for 1942, 1942, **41**: 310-4, bibl. 1.

EDGERTON, L. J. 631.859
The use of metaphosphate in nutrient solutions.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 237-9, bibl. 4.

STEPHENS, C. G., AND OERTEL, A. C. 631.811.9: 547.25.77
Responses of plants to molybdenum in pot experiments on the Cressy Shaley clay-loam.
J. Coun. sci. industr. Res., Aust., 1943, **16**: 69-73, bibl. 11.
Plants concerned were clover and rye grass.

EMMERT, E. M., AND WALTMAN, C. S. 581.192
A rapid method for estimating carbon contained in plant tissue extracts.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 245-50, bibl. 4.

HEDLUND, T. 581.13
Ämnestransportens och saftspänningens inverkan på tillväxthastigheten hos växterna. (**The transport of reserve materials and the effect of cell turgidity on the rate of cell growth.**)
[German summary 2 pp.]
K. LantbrAkad. Tidskr. Stockh., 1942, **81**: 459-88, bibl. 22.

CASTLE, E. S. 581.14
A technique for making and recording measurements of sub-microscopic increments of growth of single plant cells at very short intervals of time.
Chron. bot., 1942, **7**: 264-5.

WOODMAN, H. E., AND EVANS, R. E. 636.086: 635.964
The value of lawn-grass cuttings in the feeding of bacon pigs.
J. agric. Sci., 1943, **33**: 101-12, bibl. 8.

TREE FRUITS, DECIDUOUS.

General.

1139. MCGILLIVRAY, K. D. 634.1/2
The deciduous fruit position. Points to consider before planting new areas.
Agric. Gaz. N.S.W., 1943, **54**: 271-4.
Advice to those who are contemplating planting in different parts of New South Wales.

1140. HATTON, R. G. 634.1/8: 351.823.1
Fruit planting policy with special reference to quality of material.
A.R. East Malling Res. Stat. for 1942, A26, 1943, pp. 90-3.
The author shows how under pressure of wartime needs the principle of safeguarding the quality of planting material

has been embodied in British fruit planting policy at least as regards strawberries and black currants, growers being allowed to plant only approved strawberry runners and certified black currant bushes. Raspberries with their marked susceptibility to environment and to virus diseases not entirely worked out as yet present a difficult problem for certification. But it is to be hoped that they and red currants and gooseberries will eventually be brought under certification schemes. The author describes how compulsory and voluntary schemes for certification of fruit tree material had already before the war been adopted in Germany and Holland respectively. He urges that the English buyer also should be able to know what he is buying in England, whether it is, for instance, Cox on seedling or Cox on No. IX. He outlines a scheme which should enable the nurseryman to produce and the inspector to certify such pedigree stock.

1141. HOBLYN, T. N. 634.1/7: 31
The value of a fruit farm census.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 93-6.

The need is stressed for more exact knowledge of fruit plantings in this country as a basis for the better organization of the fruit industry. How this National Fruit Tree Census is to be made is discussed [see also *H.A.*, 13: 711].

1142. PEARCE, S. C. 634.1/2: 581.14
The statistical interpretation of vigour measurements of fruit trees.
J. Pomol., 1943, **20**: 111-5, bibl. 11.

Evidence is given to show that in applying the analysis of variance to measurements of tree weight, extension growth, and either girth or area of cross-section of stem of fruit trees, it is better to use the logarithms of the data. This result was arrived at by consideration of the stability of the variances with different means, and the normality of the distribution of these measurements. [Author's summary.]

Breeding and selection.

1143. JOHANSSON, E. 634.1/7-1.523
Om uppdragning av nya fruktsorter. **(The breeding of new fruit varieties.)**
Sverig. pomol. Fören. Årsskr., 1942, **33**: 121-30.

A review of work on fruit breeding in different parts of the world. The author notes that Fischer in 1937, dealing with questions of habitat and cultivated regions of fruits and berries, mentions the four regions of origin of fruit trees as the Caucasian region, the Turkestan region, the East Asiatic, including the East Siberian region, and the North American region. Certain varieties are mentioned as having been important for the origin of Swedish cultivated varieties. Points dealt with include crossing or combination breeding; origin of new varieties by mutation; origin of new varieties through changes of chromosome number. Tetraploid types of apples and pears may in certain cases arise by crossing between a triploid and a diploid variety. There are now quite a large number of such tetraploid types, particularly of apples.

1144. ANON. 634.11-1.523
Tetraploide Apfelbäume in Schweden. **(Tetraploid apple trees in Sweden.)**
Schweiz. Z. Obst- u. Weinb., 1943, **52**: 480.

According to the journal *Obst und Gemüse* the tetraploid apple trees in the nurseries of Alnarp and Ramlöse, Sweden, have flowered for the first time. These trees were raised by Nielsson-Ehle for the production of triploid varieties.

1145. BORISOGLEBSKII, A. D. 634.1/2-2.111-1.521.6
In memory of I. A. Efremov. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 82-4.

The work of the late I. A. Efremov is discussed. By sowing seeds and selecting the seedlings Efremov produced 12 varieties of apples, 10 of plums and 2 of peaches, all capable of growing in the Amur region where winter temperatures of —52° C. are sometimes experienced.

1146. USATOV, S. P. 634-2.111-1.521.6
The campaign for fruit growing in the north. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 80-1.

By sowing the seeds and by selection among the surviving seedlings, the author has produced many hardy new varieties of apple, pear, plum, sour cherry, apricot and small bush fruits.

1147. BIRJUKOV, A. P. 634.11-1.524
New apple varieties in the forest steppes of the Trans-urals. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 45-9.

A search was made for seedling apple trees in the garden of the Trans-Ural area and over 300 forms were found. Twenty of them selected on the grounds of yield, frost resistance, quality of fruit and keeping capacity are here briefly described, with notes on their origin where known.

1148. DIBROVA, P. A. 634.11-1.524
New apple varieties from the northern Urals. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 30-41.

Varieties of fruit trees introduced from elsewhere, even from adjacent provinces, will not grow in the northern Urals and the local inhabitants have produced a number of their own varieties by sowing the seeds of many different kinds of fruit and selecting the best of the surviving seedlings. Some of the varieties produced in this way thrive and bear fruit of quite good quality; 95 valuable varieties of apple, 6 of sour cherry and 4 of plums have been described. The method of producing these seedlings is described and descriptions and illustrations are given of the best of the apples, some of which have survived for periods of 40 years or more, during which time the temperature has occasionally been as low as −50° C.

1149. VARENTSOV, I. J. 634.11-2.111-1.524
Chemical and technological characteristics of the Reinette apples of the Krasnojarsk zone. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 69-76.

The semi-wild Siberian Reinettes are the product of natural selection against the most extreme climatic conditions and exist in a variety of different forms. A study has been made of these forms and descriptions are here given of some of them; data are presented concerning the origin, size, quality, keeping capacity and chemical composition of the fruit and the quality of the jam, wine and liquor produced from it. Some varieties are suitable for eating, others only for preserving.

1150. OLONIČENKO, A. I. 634.11-2.111-1.521.6
A new apple variety for Siberia. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 28-9.

Selections for winter hardiness and size of fruit were made among several thousand seedlings of the apple variety Arkad Dymčatyi. The best selection was propagated on a *Malus baccata* stock, which caused it to produce larger and less acid fruits. The new variety, which has been named Poljarnoe [Polar], withstands temperatures of −59° C. and is also extremely drought resistant.

1151. KALAŠNIKOV, V. M. 634.13-2.111-1.521.6
Cultivated pear varieties of the Far East. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 50-6.

The climatic conditions of the Far Eastern Provinces of the U.S.S.R. are too severe for *Pyrus communis* and all the pears

grown belong to the local species *P. ussuriensis, P. ovoidea, P. serotina* or their hybrids. Some of the commonest forms are described and illustrated, with indications of their origin and the regions for which each is suited. Though most of them are inferior to the pears of the northern U.S.S.R. in quality, their extreme frost resistance makes them valuable both for immediate cultivation and for hybridization.

1152. ŽAVORONKOV, P. A. 634.13-2.111-1.521.6
The pear in the Čeljabinsk province. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 57-9.
Brief descriptions are given of some of the pear varieties that have survived the severe conditions of the winter in the Čeljabinsk province.

1153. TIKHONOV, N. N. 634.22-1.524
Prunus triflora. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 15-27.
This species was introduced into the Far Eastern Provinces of the U.S.S.R. many centuries ago from China or Korea and later became wild, owing to its extreme hardiness, some forms having withstood temperatures of −56° C. Fresh introductions have recently been made from Manchuria; these, though somewhat less hardy, include many valuable types, the best of which are equal to the European domestic plum in fruit flavour and sugar content. The plants are almost self-sterile but set fruit freely when several varieties are allowed to interpollinate. Descriptions are given of some of the most promising of the introductions and hybrids. Some data are given showing the way *P. triflora* and its hybrids will thrive in severe northern climates, and the main diseases to which it is subject are described.

1154. SALAMATOV, M. P. 634.22-2.111-1.521.6
The plum in the Čeljabinsk province.
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 62-3.
The hardiest plums in the Čeljabinsk province have proved to be those introduced from the Far Eastern provinces of the U.S.S.R., most of which have arisen from *Prunus triflora*. Certain Canadian hybrids of *P. nigra, P. americana, P. salicina* and *P. besseyi* are also very hardy. A certain number of promising new forms have been produced by selecting seedlings of *P. triflora* and of the Canadian hybrids.

1155. KELLI, A. Č. 634.23-2.111-1.521.6
The Ural'skaja Krasavitsa acid cherry. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 60-1.
The variety Ural'skaja Krasavitsa [Ural Belle] was selected by G. S. Lopatyškin in Sverdlocsk from the local Ural acid cherry and has remained undamaged by frost for the last 15 years, although many other Ural cherry varieties have failed to survive.

1156. FRENCH, A. P. 634.23
Plant characters of cherry varieties.
Bull. Mass. agric. Exp. Stat. **401**, 1943, pp. 23, bibl. 6.
The bulletin elaborates the distinguishing characters of sweet, acid and Duke cherry varieties. Identification keys and a number of photographic plates help to achieve this object.

1157. DUNBAR, C. O. 634.25
Some newer peach varieties for south-central Pennsylvania.
Bull. Pa agric. Exp. Stat. **442**, 1943, pp. 10.
The results of observations on peach varieties made under actual commercial conditions in growers' orchards are recorded in this bulletin. 30 varieties are described and listed according to their usefulness for cultivation in south-central Pennsylvania.

Propagation and rootstocks.

1158. ANON. 634.1/7-1.541.11
Nursery established for fruit tree stocks.
Fruit World, Melbourne, 1943, **44**: 5: 4.
The New Zealand Fruitgrowers Association are to establish a nursery for the propagation and study of rootstocks. The step is an important one for the N.Z. fruit industry.

1159. INGRAM, C. 634.23-1.541
A new method of graftage.
Gdnrs' Chron., 1943, **104**: 68.
A note is given on a method of grafting cherry in August with spurs which would then be about 17 months old instead of with buds from wood of the current season. A photograph illustrates the remarkable development of two such buds in under four months' growth after insertion on the stem of a young decapitated cherry. Similar experiments on the boughs of larger cherries have been successful. The mass of foliage formed by these buds makes it necessary to support them, or breakage at the point of union may occur in high winds.

1160. OVERHOLSER, E. L., AND OTHERS.
631.541.11: 634.1/2-1.537
Nursery fruit trees, dwarf and standard understocks, their handling and planting.
Pop. Bull. Wash. agric. Exp. Stat. **170**, 1943, pp. 63, bibl. 66.
After noting the reasons for the choice of pedigree trees, and legislation covering the movement of horticultural material, the authors summarize the performance of fruit tree rootstocks in North America. In apples the hardy and vigorous seedlings and the Malling rootstocks are considered in relation to their effect upon scion varieties. Their propagation, root development, uniformity, precocity, yields, effect on quality of fruit, anchorage and cold resistance, susceptibility to disease and length of life, are summarized. Opinions of current workers, in the U.S.A., on the uses of semi-dwarfing and dwarfing apple stocks are not very favourable, though the semi-dwarfing stocks are regarded as having "possibilities". Rootstocks for apricots, cherries, peaches and nectarines, pears and plums are also reviewed. Apricots are worked mainly upon apricot, though peach and plum are used to some extent. The Western Sand Cherry (*P. besseyi*) makes a dwarf tree. The two chief stocks for cherries are the wild sweet (*P. avium*) and the Mahaleb (*P. mahaleb*), growers favouring the former and nurserymen the latter. Mahaleb is said to be grown from layers, cuttings and suckers. This is contrary to its performance in England where Mahaleb rootstocks, under acid cherries, have not been known to sucker, layers are shy to root and both hardwood and root cuttings have completely failed. Dwarfing rootstocks for cherries are mentioned as being used only to a limited extent in America. The great majority of peaches and nectarines are grown on peach seedling roots. Occasional attempts to use dwarfing rootstocks for peaches are mentioned. The chief pear rootstocks used are still the perry types (*Pyrus communis*) which have proved very satisfactory. Seeds of Beurre d'Anjou, Hardy, Bartlett and Winter Nelis produce good seedlings. Bartlett seedlings sucker little but Winter Nelis tend to do so. The oriental pears, introduced because of their resistance to "black end", have all proved unsatisfactory. Quince rootstocks, used for their dwarfing effects, are susceptible to cold injury and require more attention when planted out. Myrobalan (*P. cerasifera*) is the chief plum rootstock. Next comes the peach (*P. persica*) which is good for most of the Japanese plums, especially in sandy soils. Varieties incompatible with Myrobalan appear to do well on peach. A number of other plum rootstocks are mentioned as having been used for special purposes. Variations in nursery practice, affecting resulting trees, are described in considerable detail. Rootgrafted and budded trees, height of budding, doubleworking, age and maturity

at digging and grading trees for sale all receive due attention. The use of resistant frameworks against fireblight in pears is mentioned. Commenting on doubleworking, to circumvent stock/scion incompatibility, the authors write, " Generally the first scion, or intermediate, is allowed to grow for at least a year before the second scion of the desired variety is grafted thereon." The practicability of doubleworking in one operation, thus saving a year, is not mentioned [for which see *A.R. East Malling Res. Stat. for 1939*, pp. 84-6]. The importance of the recognition of diseases in young trees and their exclusion or disinfection receives due attention, special, detailed treatment being recommended against crown gall. Details are given of raising rootstocks from seed, overwintering and protection of nursery stock, and preparation for planting. The first steps in the production of the modified central leader tree are described. Various planting plans are discussed. The use of growth substances in propagating and improving crotch-angles of trees is reviewed. The bulletin ends with advice on protection of trees against rodents by means of poisons, repellent paints and protectors made of one-fourth-inch mesh hardware cloth. R.J.G.

1161. GARNER, R. J. 634.1/2-1.541.11
Raising rootstocks.*
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 84-90.

The vegetative propagation of fruit tree rootstocks as practised at East Malling by stooling, layering and hardwood and root cuttings is described in detail. The methods of establishing stool and layer beds and of their management and how to handle the rooted material up to but exclusive of the operation of grafting or budding are noted. A comparison of methods used with different material shows that the apple stocks, except the shy rooters, and the quinces A, B and C are propagated by stooling, plums Brompton, Common Mussel, Common Plum and Myrobalan B, large fruited and other shy rooting quinces and Mazzard cherries by layering, Marianna, Myrobalan B, and quinces A, B and C also by hardwood cuttings and Common Mussel also by root cuttings. A well managed stoolbed should have a productive life of 15 years or more. Good cultivation, manuring according to growth and cutting off the crop whilst the shoots are still dormant help to ensure long life. Stool and layer beds do not reach full production for 4 or 5 years after planting. The crop varies greatly with variety and local conditions. A return of 10,000 or 12,000 first grade rootstocks per acre can be expected at the end of the second season, rising to 30,000 in the fifth year. In full production an average crop of 50,000 rootstocks is satisfactory, 30,000 to line out for budding and 20,000 fit to bed for a further season. Common Mussel and Brompton tend to produce less and quince A more than the figures given. A rootstock lined out in the winter is usually budded the following summer when in rapid growth. The bud generally stays dormant till the following spring. The article is full of practical suggestions.

1162. SINHA, A. C., AND VYVYAN, M. C. 634.1/2-1.535.4
Studies on the vegetative propagation of fruit tree rootstocks. II. By hardwood cuttings.
J. Pomol., 1943, **20**: 127-35, bibl. 13.

The results of three experiments on hardwood cuttings of plum and apple rootstocks are discussed. 1. Cuttings of Myrobalan B taken from a mature hedge rooted 80%, from a layer bed 69%, from budded layers 47% and from one-year-old rooted cuttings 28%. The position of the apical cut in relation to the joint below had no effect, neither did irrigation of the soil in which the cuttings were set. 2. Cuttings of Common Mussel (C.M.) and Pershore (P.) were taken from the tips, middles and bases of shoots whose bases had or had not been etiolated. Some of each kind were treated with 20 p.p.m. indolebutyric acid before planting, the remainder with distilled water. C.M. rooted much better than P. Relative rooting of tips, middles and bases depended on variety and on etiolation treatment. In C.M. etiolation greatly increased rooting of basal cuttings, did not affect tips and decreased the rooting of middles, thus confirming the results of previous experiments.* In P., etiolation improved tip rooting and basal rooting. Rooting of basal and middle shoots of both C.M. and P. were greatly improved by treatment with growth substances. 3. Cuttings of Myrobalan B and Pershore and two apple rootstocks, II and IX, were unaffected as regards rooting by treatment before planting with indolebutyric acid or its potassium salt at three different concentrations or with distilled water either in continuous light or darkness. Myrobalan rooted well, the remainder indifferently. It is remarked that it is unwise to draw general conclusions from observations carried out on single varieties, since varieties differ in rooting capacity and in response to identical treatments.

* For a review of modern methods see " Propagation by cuttings and layers. Recent work and its application, with special reference to stone and pome fruits ", by R. J. Garner, being *Tech. Commun. Bur. Hort.* 14 (in the press), 3s. 6d.

1163. VYVYAN, M. C. 631.535: 634.1/2
The propagation of fruit tree stocks by stem cuttings. III. Further observations on hardwood cuttings.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 40-7, bibl. 4.

The author gives an account of numerous trials with hardwood cuttings carried out at East Malling over a period of years. Though many of them were inconclusive, certain definite facts have emerged and are discussed here. Thus great varietal differences in rooting capacity are found. Seasonal variation in performance is very marked. The source of material is important, thus in Myrobalan B cuttings from a hedge rooted better than those from a layer bed. In Common Mussel etiolation of the base of a shoot was found to improve rooting in the basal cutting but to depress it in cuttings taken higher up. Shelter from wind and shading with muslin have generally proved harmful. The greatest improvement in rooting and in size has followed the insertion of a layer of humus (sphagnum moss or spent hops) under the sand of the cutting bed.

1164. TYDEMAN, H. M. 634.11-1.541.11
Further studies on new varieties of apple rootstocks.
J. Pomol., 1943, **20**: 116-26, bibl. 9.

Details of the behaviour during three years of Cox's Orange Pippin and Lane's Prince Albert apples worked on 38 rootstocks selected from families of crosses between the Malling series of Paradise are given. While all the rootstocks proved compatible with Cox's and Lane's, there were wide variations in percentage bud take with Cox's and in their capacity for inducing vigour in both scion varieties, the range in either direction being considerably greater than that of the Malling stocks at present in use. Dwarfing characters and early productivity were still related, though some of the new vigorous stocks give indication of an increased precocity compared with the vigorous stocks of the present Malling series. Trees on the new stocks also differed greatly in powers of anchorage, relative flexibility of shoots, time of autumn defoliation and susceptibility to marginal and interveinal leaf scorch. Some of these rootstocks may be found to be an improvement on those at present in use in certain definite respects, for instance the very vigorous 3430, while larger, is also more precocious than No. XII, while 3435 combines early vigour and early cropping to a remarkable degree. New rootstocks similar to II have been found that are easier rooting and less subject to leaf scorch, while some very dwarfing stocks equal to IX show greatly increased roothold. In discussing the genetical implications it is suggested that such characters as vigour in these rootstocks are controlled by reduplicated factors

cumulative in their effects. A list is given and the parents are indicated of 18 crosses which have been selected for a further period of observation with a view to ultimate introduction of any that can pass the rigid selection.

1165. UPSHALL, W. H. 634.11-1.541.11
Malling stocks and French crab seedlings as stocks for five varieties of apples III.
Sci. Agric., 1943, **23**: 537-45, bibl. 5.
A report on results obtained at the Malling apple rootstock orchard at the Vineland Horticultural Experiment Station, Ontario, the trees being now in their 13th year of growth. Trees on Malling I and II are about three-quarters the size of, and on XVI equal to, trees on French crab seedlings. Rhode Island Greening on Malling I is liable to break at the union and when Delicious is the scion both I and II show a tendency to blow over. Trees on I, II, XVI and crab are close together as regards yield within any given variety, I and II having a higher proportion of Grade No. 1 fruit but of somewhat smaller size than that of XVI and crab. Trees on French crab seedlings have been no more variable in growth or fruiting than trees on clonal rootstocks. Trees on Malling IX have fruited well and remain very dwarf, but since they need continuous and substantial support, they are not likely to be favourably considered in commercial planting. In the private kitchen garden they have their uses.

1166. SUDDS, R. H. 634.11-1.541.11
The effect of the rootstock on nine years' growth and yield of four apple varieties.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 326-34, bibl. 3.
The growth and yield of apple trees budded on several rootstocks and set out at Kearneysville, West Virginia, 9 years ago are recorded. The scion varieties are Gallia Beauty, Starking, Staymared and York Imperial. The seedling rootstocks are from open-pollinated seed of Delicious, Grimes Golden, Jonathan, McIntosh, Northern Spy, Rome Beauty, Wealthy, Winesap, French Crab; the clonal stocks are Northern Spy, Malling I, XIII and XV, and clones from United States Department of Agriculture 313, 316, 317, 323, 329. Unsatisfactory performance with all four scions was given by Malling I, XIII, U.S.D.A. 313, French Crab, Grimes Golden, Delicious, Rome Beauty and Northern Spy. With the remaining stocks those unsuited to one scion variety proved satisfactory with the others, thus it would be hazardous to predict the general performance of any stock from the varieties worked on that stock. Some possibly increased uniformity due to clonal stock was markedly obscured by soil variation. The best all round performance in weight of top, trunk circumference and yield with all four scions was given by clonal rootstock 316 and Jonathan seedling. Apparently the trees were bench grafted but scion rooting in this orchard was negligible.

1167. GREVE, E. W. 634.11-1.541.11
A comparison of the variability in the top weight and yield of five varieties of apples grown on their own and seedling roots.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 337-41, bibl. 4.
Yield of fruit was not increased and variability in top weight and yield was not reduced by growing apple trees on their own roots in comparison with similar varieties on seedling stock.

1168. MCCLINTOCK, J. A. 634.11-1.541.11
Virginia crab as an own-rooted and an intermediate stock.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 353-6.
Virginia crab as a rootstock produces vigorous healthy trees but is difficult to propagate vegetatively. When used as an intermediate on French crab it does not impart the same vigorous growth to the scion as when on its own roots. There are various methods by which Virginia crab can be formed into an own rooted stock, such as root grafting on French crab and awaiting the development of scion roots which, when they occur, will gradually suppress the French crab roots. The use of constrictions stimulates sucker production on the French crab rootstock which merely delays scion rooting. Scion rooting has been stimulated by treatment with organic acids and amides in various carriers such as lanoline or talc, but all these methods are laborious and slow.

1169. LINCOLN, F. B. 634.11-1.541.11
Scion rooting of apple grafts as related to the vegetativeness of the scions used.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 335-6.
At Maryland Agricultural Experiment Station a considerably higher percentage of scion rooting was obtained when the scions consisted of bearing wood from fruiting trees as compared with strong young wood from decapitated trees. The grafts were bench grafted and planted in sandy loam with the top bud exposed. Scion varieties were Stayman Winesap, York Imperial, Starking and Gallia Beauty in ascending order of scion root production. The rootstocks were seedling, Malling XIII and XV. If scion rooting is desired on the scions of root grafts, it is better not to cut the trees back the first year in the nursery.

1170. SIEGLER, E. A. 634.11-1.541.11-2.19
Apple stocks exhibiting noninfectious hairy root and their use in bench grafting.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 342-8, bibl. 3.
Apple seedlings possessing somewhat fibrous or hairy root systems are thought to have a dwarfing effect on the scions. Experiments are reported which have been designed to test this material under a combination of methods not commonly practised and thus to afford alternatives in propagation methods suitable for this type of material.

1171. TUKEY, H. B., AND BRASE, K. D. 634.11-1.541.11
The dwarfing effect of an intermediate stem-piece of Malling IX apple.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 357-64, bibl. 6.
Malling IX used at the New York State Experiment Station as a 3-inch-long intermediate on French crab seedling rootstock somewhat dwarfed the scion variety and produced earlier first bearing but only to a slightly greater degree than McIntosh used as the intermediate. Trees worked direct on Malling IX were decidedly dwarfer and earlier in coming into bearing than when IX was the intermediate.

1172. KUZNETZOV, P. V. 634.22: 575.127.2
The role of *Pyrus salicifolia* Pall. in the development of fruit growing in arid regions. [Russian.]
Sovetsk. Botanika, 1941, No. 1-2, pp. 103-7.
Details are given regarding the habitat and biology of *Pyrus salicifolia*. It is highly drought resistant and tolerant of extreme temperature changes and of chalky or saline soils; it is also resistant to scab, woolly aphis and many other diseases and pests. Forms varying in time of ripening from August to October have been found. Variation has been observed in other features, too, and descriptions are given of some of the forms. Pears grafted on to *P. salicifolia* do better in arid soils than those on *P. communis* rootstocks. Natural hybrids between *P. salicifolia* and the common pear have been found and a great number of others have been made artificially. The success of the crosses varies very much in different varietal combinations. The hybrids are mostly intermediate between the two species, but many of them have leaves resembling those of *P. heterophylla*.

Pollination.

1173. SNYDER, J. C. 634.11: 581.162.3
Commercial hand pollination methods for apples in the northwest.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 183-6.

In seasons when insect activity during blossoming has been poor or in orchards where natural sources of pollen are scarce, hand pollination of apples has increased yields enormously. A brief account is given of the various developments of the technique employed. In the present system the blossoms are collected when in the balloon stage, just before the anthers begin to dehisce, and the face of each is rubbed against an 8-mesh wire cloth screen fitted over a box or other suitable receptacle. Even coarser screens are sometimes advised as speeding up collection. The debris that filters through can be screened out later when the pollen is placed in the curing tray to ripen in a warm ventilated atmosphere. The curing trays are often hand-made of paper, or lids of cardboard boxes may be used. The proper stage for applying the pollen is when the anthers have started to dehisce. Application is made with a No. 4 or 5 pig-hair brush, sometimes with the bristles cut and otherwise treated so as to produce a flat surface capable of touching all parts of the pistil at the same time, for at least one pollen grain must adhere to each of the five parts of the pistil if a properly shaped apple is to result. Pollen being stored until the blossoms are receptive should not be kept in tightly stoppered vessels.

1174. BROWN, A. G. 634.13: 581.145.1
The order and period of blossoming in pear varieties.
J. Pomol., 1943, **20**: 107-10, bibl. 2.

The order and period of blossoming of 56 varieties of cordon pears on Malling quince A rootstock at John Innes Horticultural Institution are given for the years 1939-42. The order of flowering did not vary appreciably but the dates of first flowering and the average number of days between flower opening and petal fall varied from year to year. To allow for year to year differences it is important to plant those varieties whose flowering times most closely correspond.

1175. (ASSOCIATION OF APPLIED BIOLOGISTS.) 638.12
Symposium on the honey-bee.
Ann. app. Biol., 1943, **30**: 189-97.

(I) BUTLER, C. G. 638.15
The position of the honey-bee in the national economy. Adult bee diseases, pp. 189-91.

In only three counties of England and Wales, namely Hertfordshire, Middlesex and Surrey, are there more than 3 colonies of bees per 100 acres. The honey-bee is undoubtedly the most important insect pollinator and its presence is essential for the production of maximum fruit crops. Of adult bee diseases acarine disease caused by the mite *Acarapis woodi* is widespread. Nosema disease is due to the parasitic protozoon *Nosema apis*. Others noted are paralysis, due to different causes and the so-called amoeba disease, the latter at present common on the Continent but scarce here.

(II) MILNE, P. S. 638.15
Brood diseases of the honey-bee, pp. 191-4.

Addled brood is due to some defect in the queen of the affected colony. Requeening is all that is necessary. Chalk brood due to the fungus *Pericystis apis* is not very serious. Strong colonies kept in dry, well-ventilated hives are the best form of defence. Foul brood both American (*Bacillus larvae*) and European (*Bacillus pluton*) are very much more serious. No cure is known for either disease. No drug has yet been discovered which will prevent the death of an infected larva or stop the spread of infection within the colony and there is no reliable means of disinfecting combs from diseased colonies. Methods of dealing with the diseases and preventing their spread are discussed.

(III) CARTER, G. A. 638.12: 632.951/2
Orchard spray poisoning of the honey bee, p. 195.

No cases of poisoning with nicotine, nicotine sulphate, lime-sulphur or copper have been noted. Bees die from arsenic collected as spray or from contaminated pollen—there is no evidence of poisoned nectar being collected. Weakening of the colony may result. It is suggested that spray programmes should be so arranged that arsenic is used only in conjunction with lime-sulphur after petal fall. The lime-sulphur acts as a repellent. Provision of water within the hive by means of frame feeders is also helpful. [In the discussion, evidence was produced by M. H. Moore that under certain conditions bees were likely to overcome their repugnance to lime-sulphur sprayed blossom as soon as the smell had somewhat abated.]

(IV) BUTLER, C. G. 638.12: 581.162.3
Work on bee repellants. Management of colonies for pollination, pp. 195-6, bibl. 2.

Repellents.—Recent work at Rothamsted has shown that the application of an arsenical spray to flowers in which bees are working is likely to kill 90% of the bees pollinating those flowers. The spraying of open blossom should therefore be avoided, including those of weeds or other plants. *Management of colonies for pollination.*—Individual bees are constant in their attentions to one particular patch of flowers and prefer to forage near the hive rather than farther away and, were it not that on the stable population is superimposed a fluctuating population of wandering bees, either young bees without fixed memories or bees driven farther afield by competition, orchard pollination would be uneven. Thus in order to obtain effective cross-pollination throughout an orchard a very powerful force of bees is necessary. Competition between the crop to be pollinated and other flowers may occur, for example there may be poor results in plum orchards containing many dandelions, the bees preferring the dandelions as providing the greater amount of nectar. Until it is established how many colonies of bees are necessary to produce a maximum crop in a given orchard the hives should be grouped in the centre. A sufficient force of bees will ensure an equal set throughout the orchard, with an insufficient force the highest yield will be obtained nearest the hives. When bees are used to pollinate pure seed crops the problem is almost reversed and excessive wandering through too many colonies must be avoided. Some further suggestions in the case of pure seed crop pollination are made and the reasons for them explained. For instance, neighbouring flowers should not be cut prior to the cutting of the seed crop; in a homogeneous plot of large area the hives should be placed in the centre of the plot but in the case of a number of plots of different varieties of the same species close together, excessive wandering will be prevented if the bees are placed 200 yds. away. An intelligent use of honey-bees is likely to show greatly increased yields.

(V) FINNEY, D. J. 638.12: 581.084.2
The design and interpretation of bee experiments, p. 197.

1176. Butler, C. G., Finney, D. J., and Schiele, P. 638.12: 632.95
Experiments on the poisoning of honeybees by insecticidal and fungicidal sprays used in orchards.
Ann. appl. Biol., 1943, **30**: 143-50, bibl. 8.
The danger from lead arsenate sprays to bees collecting the contaminated water from the foliage of fruit trees or nearby weeds might be removed by the incorporation of at least 1% lime-sulphur or 0·05% nicotine sulphate in the pre- and post-blossom sprays, provided alternative sources of water are available. These repellants are effective for about 7 days.

1177. Olmo, H. P. 634.1/8: 581.162.3: 631.521
Choice of parent as influencing seed germination in fruits.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 171-5, bibl. 10.

Manuring and cultural practice.

1178. Walsh, T., and Clarke, E. J. 634.11-1.4
Characteristics of some Irish orchard soils in relation to apple tree growth.
J. Dep. Agric. Éire, 1943, **40**: 61-122, bibl. 7.
The results of an extensive survey of soils and orchards in the Irish counties of Kilkenny, Tipperary and Waterford are presented. The major portion of the soils examined belonged to either of the two groups Brown Earth or Brown Limestone as defined by Gallagher and Walsh, a small number being intermediate. The former is well suited to the production of high class dessert and culinary apples, whereas the latter fails to yield fruits of the dessert class. Although the mechanical analysis technique does not reveal any appreciable difference in structure between the two groups, the Brown Limestone is more tenacious, more subject to induration on drying and less permeable than Brown Earth. It is suggested that the heavier texture of Brown Limestone is due to the more siliceous nature of its clay. Further study into soil structure is thought to be well worth while in view of the extent to which the water dispersability of the clay fraction influences the development of the root system. Nitrogen starvation was a striking feature in the great majority of soils tested, the content of surface samples being as low as 0·10-0·20 in many cases and the subsoil exceeding this figure only in one or two instances. There was a close relationship between general orchard management and incidence of nitrogen deficiency symptoms. It was found that development of high colour could be observed not only on apples from nitrogen-starved soils but also on fruits grown on a well-balanced nutrient medium with a high level of potash. Leaf scorch was a frequently observed symptom of the widespread potash deficiency. It was seen to occur in many cases where the subsoil content of potash was low despite relatively heavy surface dressings. Soils of the Brown Limestone group produced this disorder much more readily than Brown Earth soils because of their potash immobilization. Dessert varieties were more susceptible to leaf scorch than culinary varieties. Lack of attention to the phosphate needs of the surface and subsoils has so far had no serious consequences. The supply of lime and magnesium is sufficient. No clear-cut relationship between organic matter status of the soils and tree growth could be established. Some of the best orchards, however, had an organic matter status considerably higher than that of the average orchard soil.

1179. Anon. 634.1/2
Experiments in a neglected orchard.
Orchard. N.Z., 1943, **16**: 6: 3-7 and 7: 3-6.
A neglected apple orchard of 404 trees at Huapai, Auckland, N.Z. was taken over by the Plant Diseases Division in 1937 to demonstrate the efficacy of modern methods in disease control and to ascertain the possibility of bringing such an orchard back into economic production. The soil was gum-land clay with an impenetrable iron pan at 15 to 20 inches depth. Drainage was poor, the trees unpruned, diseased and starving. A heavy pruning the first year reduced the leaders to not more than 6, with shortened laterals and spurs thinned or removed. Heavy new growth resulted. The second year a lighter pruning removed half the new growth, the remainder being left untouched to develop fruit buds. In the third and last pruning the shoots which had developed fruit buds were shortened, fruit spurs thinned and a proportion of new wood left to form fruiting wood. Of the 8 varieties in the orchard only Gravenstein by reason of "strangulation" failed to make more than temporary improvement, though Statesman and Granny Smith also proved difficult. Annual cultivation in summer was followed by a blue lupin cover in autumn which was ploughed in in spring. An annual autumn dressing of 2 cwt. superphosphate and 1 cwt. sulphate of potash per acre was applied with the cover crop. The spring dressing consisted of 2 parts superphosphate, 1 part sulphate of potash and 1 to 3 parts sulphate of ammonia at the rate of 2 lb. to 6 lb. per tree according to size. 1 ton per acre ground lime was applied the first winter. The orchard was thoroughly drained. Trees that had fallen over were re-erected by wires running from buried logs and bolted into the leaders at the opposite side of the tree. A general spray programme (known as Cunningham's, 1935) was put in force and obtained effective control over the various pests and diseases which were rife, including codlin moth. The second part of the paper deals in detail with results obtained with the various sprays used. Apart from disease control much of the orchard's restoration to health is attributed to the improved drainage.

1180. Shaw, J. K. 634.11
Cultural practices in bearing apple orchards.
Ext. Leafl. Mass. St. Coll. **26** (revised), 1943, pp. 23.
The leaflet covers the whole ground of cultural practice in bearing apple orchards, including methods of dealing with such recent phenomena as magnesium deficiency, which was found to be common in Massachusetts orchards in 1942. The adaptation of normal cultural practices to wartime conditions, especially nitrogen shortage, is also discussed.

1181. Bailey, J. S. 634.25
Peach growing in Massachusetts.
Bull. Mass. agric. Exp. Stat. **399**, 1943, pp. 16.
Peach growing in Massachusetts is favoured by good local markets, but suffers from certain adverse conditions. Winter injury, oriental fruit moth, X-disease and the hurricane of 1938 reduced the number of trees in the State from about 304,000 in 1929 to 106,000 in 1939. Observations show that buds are killed in the Experiment Station orchards at temperatures of $-14°$ or $-15°$ F. regardless of their stage of development. Since, however, usually not more than about 5% of the buds develop into mature fruits the loss may not be too great if the remaining buds are well distributed. It was demonstrated in experiments that increased storage of reserve materials contributes to hardiness, whereas increased storage of water and nitrogen has the opposite effect. The cultural practice deduced from these results is (1) to fertilize early in the spring, (2) to cultivate thoroughly during the early part of the season and then sow a cover crop, and (3) to thin adequately. Trees which have suffered wood injuries should not be pruned until the extent of the damage can be observed accurately. After the dead parts have been removed liberal application of fertilizers and not too severe pruning will hasten the recovery of the tree. Brief descriptions are given of 10 peach varieties and their ripening season is indicated. Further advice on the establishment and management of a peach orchard relates to sites and soils, cultivation and application of fertilizers, pruning, thinning, pest and disease

control and harvesting. Since X-disease or yellow-red virus spreads hardly, if at all, from peach to peach but rapidly from choke cherry to peach, all choke cherry trees around the site should be eliminated by spraying with a chemical weed killer.

1182. (AMERICAN CHEMICAL SOCIETY.) 631.83
Symposium on the use of potassium as a fertilizer element.
Soil Sci., 1943, 55: 1-126.
The following papers were presented before the Division of Fertilizer Chemistry of the American Chemical Society at its annual meeting held in Buffalo, New York, September 1942. The papers give a picture of current knowledge on the soil-plant inter-relationships of potassium.

(I) DETURK, E. E., WOOD, L. K., AND BRAY, R. H. 631.83: 633.15
Potash fixation in corn belt soils, pp. 1-12, bibl. 7.

(II) ALBRECHT, W. A. 631.416.4: 631.83
Potassium in the soil colloid complex and plant nutrition, pp. 13-21, bibl. 15.

(III) PIERRE, W. H., AND BOWER, C. A. 631.83
Potassium absorption by plants as affected by cationic relationships, pp. 23-36, bibl. 54.

(IV) PEECH, M., AND BRADFIELD, R. 631.83: 631.821: 631.811.6
The effect of lime and magnesia on the soil potassium and on the absorption of potassium by plants, pp. 37-48, bibl. 51.

(V) CULLINAN, F. P., AND BATJER, L. P. 631.83/85: 634.25 + 634.11
Nitrogen, phosphorus and potassium inter-relationships in young peach and apple trees, pp. 49-60, bibl. 18.
The growth response of young peach and apple trees to varying nutrient levels of N, P, K in sand culture was studied in relation to the amount of these elements found in the leaves. Leaf analyses proved to be a reliable index of the supply of nutrients available to the roots; the analyses were an aid in diagnosing mineral deficiencies. Potash and phosphorus deficiencies, more noticeable in peaches than in apples, became more marked when nitrogen was plentiful. It is believed that under field conditions the soil phosphorus concentration is sufficient for the requirements of peach and apple trees. The experiments were carried out by the Bureau of Plant Industry.

(VI) HUNTER, A. S., TOTH, S. J., AND BEAR, F. E. 633.31-1.83: 631.82
Calcium-potassium ratios for alfalfa, pp. 61-72.

(VII) NIGHTINGALE, G. T. 631.83: 634.774
Physiological-chemical functions of potassium in crop growth, pp. 73-8, bibl. 14.
The possible influences of potassium on the nitrogen and carbohydrate content of the pineapple plant are considered. The required level of nitrate nutrition of pineapple varies with the opportunity for carbohydrate accumulation and can be extraordinarily low for maximum possible fruit production when carbohydrates are low. Under all conditions a certain minimum concentration of potassium in the pineapple plant is essential. When carbohydrates are high, and relatively much nitrogen is needed, additional potassium beyond that required for other functions is necessary for nitrate absorption. In practice potash, when needed, is now applied to pineapple fields to increase the absorption of nitrogen. Directly or indirectly potassium is essential for the reduction of nitrate and is intimately associated with the early stages of synthesis of protein from nitrate and perhaps for the later stages also. It thus makes for the relatively rapid use of carbohydrates. Nevertheless many experiments have shown that when adequately supplied with potassium reserves the plants were higher in carbohydrates than others deficient in this element. The self-adjustment of the plant to multiple deficiencies is discussed and except for differences in plant size the various levels of potash fertilization in the Hawaii fields have produced a typical lack of effect on the appearance of roots, stems and leaves. Phosphate as well as nitrate in some circumstances will favour the absorption of potassium, though it is not excluded that the reverse situation might occur and the potassium contribute to the greater absorption of phosphate and nitrate. The effect of potassium on cell wall thickness and stiffness of stems is considered. It is shown how lack of potash may drastically modify plant form because in such a case the potassium is often translocated to the growing fruits at the expense of the vegetative growing points, or in storage structures, as the sweet potato for example, to the embryonic tip of the storage root, the potatoes therefore increasing in length but not in breadth. In short potassium is important in its buffer relationship, it often favours absorption of nitrate, and it plays a dominant part, directly or indirectly, in protein and carbohydrate metabolism, but more specific information seems to be lacking.

(VIII) HAYLEY, D. E., AND REID, J. J. 633.71-1.83
The bearing of potassium on the quality of tobacco, pp. 79-85.
Plot work, seedbed studies, greenhouse experiments and chemical and bacteriological investigations on tobacco were conducted for 5 years at the Pennsylvania State College. Extensive field studies were also made, partly in collaboration with the Chatham Substation of the Virginia Agricultural Experiment Station. The seedbed studies revealed that the bacteria *Phytomonas tabaci* and *P. angulata*, known to cause leaf spot disease, were merely transitory physiological adaptations of *Pseudomonas fluorescens*. It was found that not one of the routine sanitary measures destroyed the organisms to which the normal tobacco plant is exposed in seedbed and field. The incidence of leaf spot disease is therefore chiefly related to the relative resistance of the host plant. The disease could be controlled by keeping the tilth and moisture-holding capacity of the soil in the best possible condition, thus producing an adequate root system and by using the minimum of water. Nutrients must be so supplied that the N/K ratio of the seedling is 0·6. The beds must be ventilated and photosynthesis must be undisturbed by excessive use of cloth. In order to provide such soil conditions the previously manured bed should be steamed in autumn. The application of a 4-8-12 fertilizer mixture at the rate of 1,000 lb. per acre is recommended. The analysis data of the leaf were found to be closely related to the quality of tobacco. First class flue-cured tobacco contains 2% N, at least 2% K, and 18-25% reducing sugars. High-quality cigar-leaf tobacco contains 3·5-4·2% N, slightly more K, decidedly less Ca, and at maturity protein N somewhat in excess of non-protein N, somewhat less than 1% oxalic acid, 8-12% malic acid, 2·5% citric acid. Any serious divergence from these figures for flue-cured

tobacco and for cigar-leaf tobacco at maturity was associated with lack of quality. An active saccharolytic microflora on flue-cured tobacco was discovered to be an index of high quality, whilst either a proteolytic or inert flora indicated low quality. There was a similar relation between microflora and quality in cigar-leaf tobacco. Smaller applications of potash resulted in a lowering of quality, of K and of reducing sugar content and an increase in N content. Potassium deficiency was found to exist in any tobacco plant that contains at maturity less potassium in the lower leaves than in the middle and upper leaves. Such deficiency was associated with susceptibility to leaf spotting. The cigar leaf must contain approximately twice as much nitrogen as does the flue-cured leaf. Discussing the effect of climatic conditions the authors state that wet season crops are better than dry season crops. Poor K content, causing poor quality and increasing disease in spite of plentiful K supply, was found to occur in years of erratic precipitation with drought followed by excessive rainfall as a consequence of interruptions in growth followed by tremendous N uptake at the break of the drought. Legume sodland proved to be a greater handicap under adverse conditions than stalkland, because it does not provide a moisture reserve for uninterrupted growth and contributes N at the wrong time. In order to ensure utilization of applied K the tilth and moisture relationships of the soil must be considered and humus must be supplied, preferably as well-rotted animal manure.

(IX) CHAPMAN, H. D., AND BROWN, S. M. 634.3-1.83
Potash in relation to citrus nutrition, pp. 87-100, bibl. 9.
The effect of potash deficiency and excess of potash on citrus was studied in automatically operated sand cultures at the Citrus Experiment Station, Riverside. Potassium deficiency in its early stage is best determined by leaf analysis, its symptoms being difficult to distinguish from other conditions of malnutrition. In the more acute stage there is evidence of leaf twisting and crinkling and of the emergence of weak, spindly new lateral shoots. The symptoms occurred both at high and low levels of other nutrients. Potassium deficient plants contained increased amounts of calcium, magnesium, sodium, nitrogen, whilst phosphorus, sulphur, chloride did not accumulate. Such plants suffered from boron excess and to a lesser extent from leaf burn caused by sodium excess. High concentrations of sodium delayed the appearance of potassium deficiency symptoms, probably because of the first mentioned metal's antagonistic effect on calcium and magnesium. Fruit from potassium deficient trees was smaller than from healthy trees, though not affected in its quality. Excess of potash produces large but coarse and poor fruit, the calcium content of which is very low. Preliminary results show that leaves containing less than 0·2% potassium probably indicate potassium deficiency; 1% and more is indicative of an ample supply of potassium. More than 3% potassium and a subnormal amount of calcium may indicate potassium excess or calcium deficiency.

(X) ULRICH, A. 581.192: 631.8
Plant analysis as a diagnostic procedure, pp. 101-12, bibl. 25.

(XI) SCARSETH, G. D. 581.192: 631.8
Plant-tissue testing in diagnosis of the nutritional status of growing plants, pp. 113-20, bibl. 8.

(XII) BAVER, L. D. 631.83
Practical applications of potassium interrelationships in soils and plants, pp. 121-6.

1183. OVERHOLSER, E. L., AND OTHERS. 634.11-1.8
Statistical analyses of the fertilizer data from the Von Osten apple orchard.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 19-22, bibl. 2, being *Sci. Pap. Agric. Wash. Exp. Stat.* **521**.
The data examined were obtained from the records of 1932-5 of the fertilizer plots of the Von Osten orchard, Wenatchee, Wash. Trunk circumferences and terminal growth were not affected by P, were significantly increased by N and decreased by K. Yield was increased only by N and in number rather than in size of fruits. Red colouring of fruits was not affected by P and K but was decreased by N or N+P or K. Reduction in colour was offset by increased yield of fancy and extra fancy fruit from plots receiving N or combinations including N.

1184. LILLELAND, O., AND BROWN, J. G. 634.25-1.85: 581.192
The phosphate nutrition of fruit trees. IV. The phosphate content of peach leaves from 130 orchards in California and some factors which may influence it.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 1-10, bibl. 7.
Leaf samples of peaches were taken for analysis from 130 California orchards in June and July, which is the period of minimum seasonal change. Variations in phosphorus content of the leaf were found between adjacent trees and a greater variability was associated with trees having the higher analyses. The phosphorus content varied markedly with nitrogen fertilization and irrigation. Poor growth could frequently be associated with high phosphorus and many of the best orchards had a low phosphorus content. Trees growing well on a soil low in available phosphorus have a phosphorus leaf content equal to that found in many of the best orchards or more fertile soils. Neither responses of annual crops to phosphate nor leaf analyses seem to be good criteria for the phosphate needs of peach trees in California and it seems as if the application of this element to other orchards in California may not be profitable.

1185. HAYWARD, H. E., AND LONG, E. M. 634.25-1.541.11
Vegetative responses of the Elberta peach on Lovell and Shalil rootstocks to high chloride and sulfate solutions.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 149-55, bibl. 5.
Elberta peach trees on Lovell and Shalil rootstocks have been grown in sand culture under differential chloride and sulphate salt treatments at the U.S. Salinity Laboratory, California, since 1940. The vegetative responses indicate that the greatest growth depression occurs in the solutions with the highest osmotic concentration of salts, though there are other specific ionic effects that must be taken into account which differ with each salt. At isosmotic concentration the chloride ion is more toxic than the sulphate ion. The relative vigour of the two rootstocks is put forward as an explanation of the differences in vegetative response of the Elberta scions. The very vigorous Shalil root system absorbs more nutritive ions and water than Lovell to the benefit of the scion at low salt levels but to its disadvantage in the presence of high concentrations of a toxic ion. This suggestion is supported by the results of leaf analysis. There is a probability of progressive salt accumulation within the plant from season to season, thus no final conclusion of the maximum concentration of salts that can be tolerated or their toxic effects at a given concentration is possible under a short term experiment.

1186. KRIEL, H. T. 634.1/2: 581.144
Breaking the "rest period" of deciduous trees.
Fmg S. Afr., 1943, **18**: 321-2.
At the Horticultural Research Station, Nelspruit, dormancy of peaches, plums and certain other trees not specified has been broken by injecting the branches with a 2½% solution of sodium thiosulphate in acid medium. Flower and leaf bud emergence began 4 to 6 weeks after treatment. The untreated control branches remained dormant. The fruit on the injected branches ripened far in advance of the fruit on untreated branches. The differences are photographically illustrated. Discussion of any possible practical application is for the moment withheld.

1187. BRYNER, W. 634.1/2-1.546
Zweigrichtklammern. **(Clamps to adjust the angle of branches.)**
Schweiz. Z. Obst- u. Weinb., 1943, **52**: 369-71.
Trials at Wädenswil confirmed the theory that branches of fruit trees crop better if kept in a horizontal position. Improving on a German model, clamps were made which will keep branches of bush trees at the required angle. The working of these clamps is so simple that on the average two branches can be adjusted a minute, thus saving a considerable amount of labour and materials. The operation should be carried out with pears in June or July, with apples in August. When the clamps are applied earlier the shoot tips will grow upwards again later on. If applied after lignification the clamps have to be left on the tree for too long a time. When put on at the right moment they can be removed after a few weeks. To adjust a young shoot arising from a horizontal branch a spiral with 5½ convolutions and a width of 5-10 mm. was used. Two to three convolutions were pushed over the old branch, the remainder over the young shoot, thus keeping it in line. The making of the two devices is described.

1188. NEW ZEALAND DEPARTMENT OF AGRICULTURE. 634.2-1.542
The pruning of stone fruit trees.
Orchard. N.Z., 1943, **16**: 5: 1-2.
Suitable methods are described for pruning orchard trees of peach, English and Japanese plum, cherries, apricots and almonds in New Zealand.

1189. ANON. 634.1/2-1.542
La poda de los arboles frutales. **(Pruning of fruit trees.)**
Sugest. oportun. Fruticult. Rio Negro, June, 1943, pp. 2-4.
Some general rules are given for the pruning of fruit trees in Argentina, the varieties not being specified. Briefly the method advocated, in addition to the usual elimination of overcrowding in the centre of the tree, is that known locally as "one long, t'others short" whereby all shoots springing from a common junction are cut fairly hard with the exception of one which is merely tipped.

1190. SAVAGE, E. F., AND COWART, F. F. 634.25-1.542: 581.144.2
The effect of pruning upon the root distribution of peach trees.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 67-70, bibl. 6.
The greater amount of dry matter in the above ground portion of lightly pruned peach trees in Georgia was reflected in the much greater total length and extent of distribution of roots. Pruning of young peaches in Georgia has undoubtedly been too severe and has reduced yields even after the pruning has been moderated. Most of the roots were found within the top 18 inches of the soil which may explain the detrimental effects of some cover crops or of even slightly eroded soil.

1191. DORSEY, M. J., AND MCMUNN, R. L. 634.11-1.55
Studies of alternate bearing in the apple.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 37-44, bibl. 7.
The aspects studied were the effect of defruiting and of time of thinning on alternate bearing in Illinois. It was shown that as the season advances the inhibiting influence of a developing crop on fruit bud initiation becomes more pronounced, in that complete crop loss before full bloom, e.g. by frost, will result in a heavy bloom the following year and that early thinning to the extent practised in commercial orchards, that is, so as to leave a full crop, was not effective in correcting biennial bearing.

1192. ROGERS, W. S. 634.1/7-1.432
Plants and their water supply.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 103-4.
The author in his broadcast talk shows how fruit crops can be helped by watering in England. Water can be conserved by weed control, drainage, extension of root range by cultivation methods, manuring and shelter from winds. Methods of artificial irrigation are described.

1193. ALLEN, F. W. 634.13-1.432: 581.192
Softening and soluble solids in Bartlett pears as influenced by soil moisture.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 106-12, bibl. 5.
Firmness and soluble solids are higher in California Bartlett pears from non-irrigated than from irrigated trees. Soluble solids and total sugars in the juice are higher in the "dry" fruit but the ratio between the two remains the same in "dry" and "wet" fruit. Soluble solids furnish an index of actual sugars and, being easily measured by a refractometer, may be used as an alternative picking index for fruit, which on account of restricted moisture has remained unduly hard.

1194. VYVYAN, M. C. 577.15.04: 631.55: 634.11 + 634.13
Sprays to control pre-harvest drop of fruit.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 47-8, bibl. 2.
Seven pairs of 20-year-old Conference pear trees formed part of the experimental material. Spraying with 4 parts per million of α-naphthaleneacetic acid three weeks before the normal time of picking resulted in a 20% increase in crop and was, therefore, thoroughly well worth while. In Bramley's Seedling apples—48 mature trees were used—an increase of about the same order was obtained by the application of the same spray and by the application of α-naphthaleneacetamide at 6 parts per million 5 weeks before picking. Later spraying of the apple trees was not so effective.

1195. ELLENWOOD, C. W., AND HOWLETT, F. S. 577.15.04: 634.11-1.55
Pre-harvest sprays in Ohio in 1942.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 193-7, bibl. 2.
At Wooster, Ohio, favourable results followed the application of naphthaleneacetic acid sprays to Stayman Winesap apple trees in the attempt to check preharvest drop, but similar spraying of McIntosh, Delicious and Red Rome Beauty was not so satisfactory.

1196. ROBERTS, R. H., AND STRUCKMEYER, B. E. 577.15.04: 634.11-1.55
The efficiency of harvest sprays after a freeze.
Proc. Amer. Soc. hort. for 1943, 1943, **42**: 198.
Indications are given from Madison, Wis., that preharvest spraying can be successfully undertaken after a frost.

1197. SOUTHWICK, L. 577.15.04: 634.11-1.55
Comparative results with sprays and dusts in controlling the preharvest drop of apples.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 199-202, bibl. 3.
In the experiment station orchards at Amherst, Mass., dusting proved less effective than spraying with Duchess and Wealthy apple trees, but with McIntosh dusts gave encouraging results. There were indications that a 20 parts per million spray may be more effective than a 10 parts per million spray.

1198. HOFFMAN, M. B., VANDOREN, A., AND EDGERTON, L. J. 577.15.04: 634.11-1.55
Further tests on the methods of applying naphthalene acetic acid for control of the pre-harvest drop of McIntosh apples.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 203-6, bibl. 3.
There was little or nothing to choose in these trials in New York State between results from the use of naphthaleneacetic acid in dust or in spray form.

1199. HALLER, M. H. 577.15.04: 634.11: 664.85.11.037
Effect of preharvest drop sprays on the storage quality of apples.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 207-10, bibl. 3.
Tests at Beltsville, Md, in 1939 and 1940 with 6 apple varieties did not show any direct effect of spraying with α-naphthaleneacetic acid on the firmness of apples or on the development of decay, breakdown or scald in apples stored at 32° F. when compared with unsprayed apples picked at the same date. An indirect effect on storage quality due to more advanced maturity at later picking made possible by spraying may result. Limited results indicate that softer fruits more subject to decay may result from the addition of 0·25 to 0·50% of summer oil to pre-harvest sprays. Wrapping the apples in shredded oiled paper resulted in an appreciable reduction in decay.

1200. OVERHOLSER, E. L., OVERLEY, F. L., AND ALLMENDINGER, D. F. 577.15.04: 634.11 +634.13
Three-year study of preharvest sprays in Washington.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 211-9, bibl. 12.
Alpha-naphthaleneacetic acid sprays at a concentration of 10 parts per million have effectively reduced the preharvest fruit drop of Delicious, Winesap and McIntosh apples and Bosc and Bartlett pears. Reducing the concentration of alpha-naphthaleneacetic acid to 6 and 3 parts per million has reduced the effectiveness of the spray. The addition of spreaders and oil have not greatly increased the effectiveness of the growth chemical spray. Lime applied with alpha-naphthaleneacetic acid sprays has reduced the effectiveness, whereas the addition of zinc sulphate may have increased the effectiveness. Applications during the warm part of the day have more effectively reduced drop than have applications made in early morning or in late evening, when the temperatures were relatively low. Spraying of water on trees 2 hours following spray of alpha-naphaleneacetic acid material reduced the effectiveness of the spray whereas water sprays after 8 and 24 hours had no effect. Little benefit was obtained from successive applications of the growth chemical sprays. The period of effectiveness of any one application may vary from 11 to 12 days with McIntosh and 21 to 28 days with the Delicious and Winesap. The period of effectiveness tends to be longer when cool weather follows the spray than when warm weather prevails. Observations have indicated that alpha-naphthaleneacetic acid sprays do not affect the fruit maturity at the time of harvest or rate of ripening, either before the fruit is harvested, or in storage so long as the fruit is picked at the proper stage of maturity. [Authors' summary.]

Harvesting and crop.

1201. PROEBSTING, E. L. 634.1/2-1.55
Relative yields of border fruit trees.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 34-6, bibl. 2.
In several apricot, peach and pear orchards in California, selected for their uniformity the yields of trees within the orchards of trees next to vacant sites and of border trees were statistically analysed to discover the extent of the influence of the extra space. The question is of some importance because in long experiments the effect of misses is often a troublesome question in the analyses. Border trees are usually omitted from calculations but often their inclusion might be a convenience. The data do not support the idea that a general correction formula can be used. The results obtained in one year were often reversed in the next. The discarding of data from trees adjoining vacancies and the desirability of including border trees in plots are matters to be determined for each orchard.

1202. HOBLYN, T. N. 634.11-1.55
Production of the fruit from four experimental apple plantations at East Malling 1920-42.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 96-102.
The cropping history of four experimental plantations, over a period of some twenty years, is described. The four principal varieties included in them are Lane's Prince Albert, Bramley's Seedling, Worcester Pearmain and Cox's Orange Pippin. Except for trees on M. IX rootstock, the yield in the first eight years from planting was negligible. When mature, the yield per tree varied for different varieties but, except for Cox's Orange Pippin, the yields per acre were not dissimilar. [Author's summary.]

1203. ANON. 634.1/8-1.55 +663.2
Erträge im schweizerischen Obst-und Weinbau. **(Production figures for fruit and wine [in Switzerland].)**
Schweiz. Z. Obst- u. Weinb., 1943, **52**: 479.
The yield of Swiss fruit (apples, pears, cherries, damsons, plums and nuts) and wine production during the period 1932-41 ranged from 3,106,000 quintals* in 1936 to 9,350,000 q. in 1937 and from 240,000 hectolitres in 1933 to 1,110,000 hl. in 1935 respectively. Average yields per cropping tree in 1941 were: apples 98 kg.; pears 100 kg.; damsons and plums 25 kg.; cherries 28 kg.; nuts 15 kg. There was no relation between size of farm and maximum or minimum yield.

1204. PEARCE, S. C. 634.11-1.56
An investigation into means of reducing the labour needed for recording crops.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 36-40, bibl. 3.
An account is given of a search for sampling methods to lighten the work of recording the total weight of an apple crop and the mean weight of single fruits. For total weight it is recommended that one bushel box be weighed from each tree, and that computing should proceed by one of three methods, the relative merits of which are discussed. [Merit varies according to degree of accuracy required and size of crop.] For large plantations fewer boxes may be weighed. For size of fruit evidence is advanced to show that division of the sample equally between the tops of stacks of three bushels is adequate, provided the weighing is carefully done. Another method is discussed, which involves taking the sample as a section through the crop. [Author's summary.]

* 1 Quintal=100 kg.

1205. Buchanan, M. T., Peterson, A. W., and Lee, G. A. 634.11-1.16
Washington apple production costs, 1939-43.
Bull. Wash. agric. Exp. Stat. **429**, 1943, pp. 11.
The purpose of the study was to determine (1) the average cost of producing apples, (2) variations from this average, (3) the cause of these variations. Major attention was given to cost of production data for 1942, but data were also obtained for the purpose of estimating production costs for the 1943-4 season. The 147 growers from the Wenatchee-Okanogan and Yakima districts of Central Washington, who furnished the data, produced on the average 12,664 boxes, of which 41% were extra fancy apples, on 31 acres.

1206. Meijburg, F. L. van der Kloot. 351.823.1: 634+635
Standardization of fruit and vegetables.
Int. Rev. Agric., Rome (*Mon. Bull. agric. Sci. Pract.*), 1943, **34**: T109-T112.
Continuing previous reports [*ibidem*, 1940, No. 5, and 1941, No. 10, not available], particulars are given on the measures enforcing standardization of fruit and vegetables in the Dominican Republic, Egypt and Esthonia.

SMALL FRUITS, VINES AND NUTS.

1207. Bologovskaya, R. P. 634.7: 575
Breeding small fruits in Siberia and the Far East.
[Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 64-8.
The aim is high quality, yield and winter hardiness. The following offer considerable promise and are being used in breeding and selection:—*Black currants:* the wild Siberian currant with its hardiness and very large berries. *Red currants: Ribes palczewski, R. manshuricum, R. atropurpureum* and *R. altissimum. Gooseberries:* the variety Houghton and *Grossularia hirtella, G. cynosbati, G. divaricata, G. aciculata* and *G. burjense. Raspberries:* local forms of *Rubus idaeus* sub-species *vulgatus* in preference to *R, melanolasius. Strawberries: Fragaria vesca, F. elatior. F. orientalis, F. platypetala* and *F. chiloensis* are not available.

1208. Grubb, N. H. 634.711-1.523
Five new raspberry seedlings.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 31-3.
A detailed account is given of 5 new raspberry varieties bred at East Malling in 1931, one parent in every case being Preussen, the others being Lloyd George, an earlier seedling derived from Lloyd George × Pyne's Royal and Baumforth Seedling A. They range from early mid-season to late mid-season. Their fruits are as large as those of any named varieties. In colour they vary but none becomes excessively dark when fully ripe. They are firm and easy to plug. Flavour ranges from fair to very good. Four are known to be tolerant carriers of mosaic. One is rather susceptible to cane blight under certain conditions. They are now being multiplied for further propagation and trial in raspberry districts.

1209. Darrow, G. M. 634.73
Rest period requirements for blueberries.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 189-94.
Highbush blueberries planted in Florida have consistently failed to grow because of an insufficient rest or chilling period. Trials were carried out to compare the chilling period (45° F.) required by cultivated northern varieties with that of the local rabbiteye variety, Pecan. With Pecan 200 hours of chilling was not enough but after 250 hours the plants seemed to have finished their rest period. With highbush cultivated varieties 800 hours were required to give good results with most varieties while 1,060 hours were sufficient for all except Jersey. Florida contains other species of blueberries which cross with the northern highbush, and varieties adapted to warm North Florida conditions could undoubtedly be evolved.

1210. O'Rourke, F. L. 634.73-1.535.4: 577.15.04
The effect of indole-butyric acid in talc on rooting of softwood cuttings of blueberries.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 369-70, bibl. 3.
The results were good enough to justify the use of indole-butyric acid as an aid to rooting softwood cuttings of *Vaccinium australe*.

1211. Beckwith, C. S. 634.73
Blueberries in the garden.
Circ. N. Jersey agric. Exp. Stat. **457**, 1943, pp. 4.

1212. Herold, G. 634.75-1.521
Sortenprüfung bei Erdbeeren. **(Variety tests of strawberries.)**
Thesis submitted to Berlin Univ., from abstract *Schweiz. Z. Obst- u. Weinb.*, 1943, **52**: 383-4.
Of 76 strawberry varieties and unnamed strains tested, 12 and 4 respectively were morphologically pistillate; all other varieties were morphologically hermaphrodites. The pistillate varieties were found to be not uniformly fertile if cross-pollinated. Also hermaphroditic varieties with partial pollen sterility need pollinators; in the same way occasionally, when a highly self-fertile variety has set poorly, cropping could be considerably increased by cross-pollination. The suitability of the pollen for cross-pollination differed according to the variety. Wind pollination occurs only within very short range. The part played by bees in the pollination of strawberries could not be ascertained. It was not always possible to decide whether a variety was highly, moderately or only slightly self-fertile. Nutritional conditions appeared to influence pollen degeneration and to cause considerable fluctuations in setting. Further investigations into the effect on yield of varying degrees of self-fertility are necessary. It is also of importance to find out whether wind or insect pollination is usual in strawberries. Susceptibility to leaf spot varied, Madame Moutôt being resistant. Resistance to red spider was strongest in hard-leaved varieties such as Madame Moutôt. No varietal differences in frost hardiness could be observed with the exception that early varieties opening their flowers sooner were damaged more severely than late varieties.

1213. Čuev, N. V., and Matveev, V. P. 634.75-1.524: 581.143.26.035.1
Hybridization of strawberries under artificial light under the conditions of the Murman province
[Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 4, pp. 77-9.
Strawberry plants were grown during the arctic winter in a windowless room under artificial light. The variety Roščinskaja came into flower on 27 November, 1937, 18 days after being placed in the artificial light. The variety Saxonka flowered two days later and pollinations between the two were made on 30 November, pollination being repeated at intervals during the period of flowering. All twelve flowers pollinated set fruit, the first of which ripened on 23 December. An average of 68 seeds per fruit was obtained. On 27 February, 1938, the seeds were sown, and the seedlings were grown in the glasshouse until 22 June, when they were planted out; they remained out of doors through the winter, and all but 5% survived. The hybrids showed various combinations of the parental characters.

1214. Havis, A. L. 634.75: 581.145.2
A developmental analysis of the strawberry fruit.
Amer. J. Bot., 1943, **30**: 311-4, bibl. 6.
A detailed developmental study of the strawberry fruit from about 12 days before anthesis to maturity showed that pith and cortex grew at approximately the same relative rate. The cortex developed more rapidly than the pith and at a more rapid relative rate than the fruit as a whole. There was little cell division in the cortex from shortly before anthesis till maturity, growth proceeding chiefly by cell enlargement. The transition from cell division to cell enlargement is a gradual one. In the pith as much as 15% to 20% of growth was due to cell division throughout the later stages of growth. The relative rates of cell division and cell enlargement in the two tissues was not significantly different in the four varieties used, Aberdeen, Blakemore. Catskill and Howard 17 (Premier).

1215. Rogers, W. S. 634.75
Reliable strawberry runners.
Fruitgrower, 1943, **96**: 203.
An account of the Strawberry Nuclear Stocks Scheme started by the Ministry of Agriculture and supervised by East Malling Research Station where much of the propagation is done. The scheme aims at providing virus-free runners of Royal Sovereign and (later) of other varieties of strawberry to growers to replace the degenerated stocks which now are almost universal. The clonal variety selected for distribution is Malling 40, an improvement on its predecessor M. 35 in being a better yielder and in not being a carrier of mild crinkle virus. Both are free from yellow edge virus at present. To provide for wartime conditions, when extra crop weight overrides considerations of quality, the variety Huxley (Brenda Gautrey) is also being propagated. Unfortunately this variety is a tolerant carrier of severe viruses, of which it does not display symptoms immediately and is consequently difficult to rogue. It should not be planted near the new Royal Sovereign strain. The strain of Huxley now being issued is to be regarded as provisional, pending the distribution of the only lightly affected clones which are now being propagated since no entirely uninfected clone has yet been found.

1216. Morrow, E. B., and Darrow, G. M. 634.75-1.55
Effect of renovation of beds after harvest on yield and grade of strawberries.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 195-7, bibl. 2.
Two-year-old strawberry beds at North Carolina Agricultural Experiment Station gave greater yields than renovated and 1-year-old beds. The 1-year-old beds had a higher percentage of No. 1 berries but not enough to compensate for their lower yields.

1217. de Carvalho e Vasconcellos, J., Santa Barbara, L., and Baptista, A. 634.851
Castas de videira. Seu estudo botanico. **(The botanical study of vine types.)**
Rev. agron., Lisbon, 1942, **30**: 91-141, 214-75.
A continuation of the ampelography of Portuguese grape vine varieties, first started *ibidem* 1941/2, 29: 177-227; *H.A.*, 12: 1276. In the two articles noted above 25 varieties are described in the first and 31 in the second. In both cases illustrations and measurements of the leaves are given.

1218. Huber, H. 634.872
Pflege der Spalierreben zur erfolgreichen Kultur von Tafeltrauben. **(Successful cultivation of table-grapes from espalier vines.)**
Schweiz. Z. Obst- u. Weinb., 1943, **52**: 354-65, 371-7, being *Flugschr. Wädenswil Versuchsanst. Obst-, Wein-, Gartenb.* **34**.
A detailed description of all aspects of table-grape cultivation on espaliers in Switzerland, supported by a number of drawings. Diseases and pests are also dealt with and a selection of white, blue and red varieties is given.

1219. de Freitas, A. G. B. 634.8-1.541.11
Aspectos do problema da afinidade em viticultura. **(The problem of compatibility in viticulture.)**
Rev. agron. Lisbon, 1942, **30**: 49-63.
Present knowledge of stock/scion relationship with special reference to its bearing on compatibility is summarized. Some differences between the problems confronting pomologists, who have hitherto done most of the physiological research, and those of the viticulturists are pointed out. The National Agricultural Research Station of Portugal has now turned its attention to the matter and a small experimental vineyard has been laid out at Alcobaça.

1220. Jacob, H. E. 634.8-1.541.11
Examples of incompatibility between grape varieties and rootstocks.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 201-3, bibl. 9.
Examples of incompatibility in *vinifera* vines are quoted from European records and a few noted during the investigational work of the California Experiment Station are briefly discussed.

1221. Peyer, E. 634.8-1.541.11
Der Anbau von amerikanischem Unterlagenholz in der Schweiz. **(Cultivation of American vine stocks in Switzerland.)**
Schweiz. Z. Obst.- u. Weinb., 1943, **52**: 472-4.
At a conference of experts and government officers held at Zürich in August 1943, two reports stressed the necessity of growing selected rootstock material of American vines in Swiss nurseries situated in suitable districts. The reasons given for this measure were (1) that demand would not only now but also in peacetime exceed supply, (2) that great losses had occurred from deterioration of imported rootstocks during transport.

1222. Olmo, H. P. 634.8: 581.162.3
Storage of grape pollen.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 219-24, bibl. 8.
Pollen collected from 3 grape varieties, namely Muscat of Alexandria, Thompson Seedless and Monukka was stored at $-12°$ C., 2° C., 10° C., room temperature and 20° C., in relative humidities of 25% and 50% except for $-12°$ C. treatment when the R.H. was 28% and 54%. Every year at the end of May the sealed containers were taken from storage, allowed to reach room temperature overnight and used in the ordinary routine breeding operations. Pollen longevity was increased most markedly at $-12°$ C. in all three varieties. At the end of 4 years the Monukka sample at $-12°$ C. had only decreased from the original 34% to 21% viability. All the pollen stored in the best conditions gave berry sets equivalent to fresh pollen after 4 years. It was demonstrated that stored pollen, giving 6% or higher viability when germinated in vitro, gives a full berry set when used in the field. At the higher temperatures the period of viability was considerably shorter and at room temperature it did not exceed a single year. It is possible from these results that the supposed optimum conditions of temperature and humidity for storage of other deciduous fruit pollens may be lower than those so far reported. A pollen bank for the storage of pollen for use as required might be established. Seedlings grown from 3-year-old pollen appear in no way different from those grown from fresh pollen, though fruiting will be necessary to determine whether any genetic changes of consequence have been produced by the aged pollen samples.

1223. Ulrich, A. 634.8-1.83
Potassium content of grape leaf petioles as an indication of the potassium status of plants.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 204-12, bibl. 12.

An analysis of vine leaf samples over 3 years from 2 soils with a similar potassium content showed that the potassium content of the petioles reflected the potassium status of the vines satisfactorily as judged by the crop yields, whereas soil analysis by the replaceable and Neubauer methods failed to do so. The leaf petioles are better indicators than the leaf blades. If the minimum potassium values occur in the petioles early in the season potassium application may favourably influence the crop.

1224. Du Toit, M. S., and Daneel, P. de V. 634.872-1.4(68.01)
The distribution and nature of Paarl table-grape soils.
Bull. Dep. Agric. Forest. S. Afr. **202**, 1940, pp. 70, bibl. 6.

From a detailed survey of the distribution and nature of Paarl table-grape soils undertaken by the Western Province Fruit Research Station, South Africa, the following points emerge among others:—In the soils which are mainly sandy or gravelly with a low content of organic matter and moisture root growth is limited to the cultivated layer. Organic materials are incorporated chiefly by ploughing in a green crop in winter. Contrary to general practice it is regarded as harmful to cultivate the soil after every light summer shower or irrigation. Cultivation during the growing season should be shallow and aim at the destruction of competing weeds. The surface soil should be kept in a friable condition so that any water supply can be absorbed as quickly as possible. Soil moisture content being the critical factor in December, there is a close relationship between precipitations in that month and the size of the export crop. The rate of shoot growth was found to be rhythmic, it dropped during blossoming and fruit setting as well as during seed and berry development. Lack of moisture between these two periods will lead to a cessation of shoot growth and to a transfer of reserve materials to the berries resulting in low yield and an early crop of poor quality and in unequal development of stalk and berry. The latter disorder will cause the maladies of "dry stalk" and "dropping berries" under cold storage conditions. The practice of not irrigating but debunching as a safeguard, aimed at earliness, is deprecated. Loss of water from the leaves is much greater than that from the bunches so that this widely adopted method does not attain its object, but results in an unnecessary reduction of yield and in earliness only at the expense of quality. Irrigation has to be applied very carefully since the vine roots are extremely sensitive to changes in moisture content; each application should bring the whole of the root zone to moisture capacity. A muddy subsoil produced by excessive water supply must be avoided. The fruit ripening process in December should take place under diminishing supply. The same applies to the post-harvest period when the leaves should be kept functioning without stimulating new growth. It takes 3-6 weeks after ploughing before nitrogen from the green crop is available. After a peak in spring further nitrification peaks coincide with irrigations in a decreasing series until they disappear towards the end of the growing season. Artificial fertilizers should be generously applied to improve the otherwise poor green crop on mountain soils. Many tables, graphs, profiles and charts illustrate the text.

1225. Meier, K. 634.8-2.19
Untersuchungen rebbaulich benützter Böden aus den Gemeinden Unterstammheim, Hüttwilen und Rudolfingen. **(Tests of vine soils at Unterstammheim, Hüttwilen and Rudolfingen.)**
Schweiz. Z. Obst- u. Weinb., 1943, **52**: 451-72.

Two disorders of vines, leaf scorch and little leaf, occurring in several Swiss districts were found to be connected with the supply of nutrients in the soil. Little leaf is associated with the formation of weak wood with short internodes. Soil analyses carried out at Wädenswil revealed severe deficiencies of phosphoric acid and potassium—not to mention nitrogen which was probably deficient as well—to be the cause of the scorch. The little leaf symptom in contrast, was observed to be produced by an overdose of those two nutrients, most likely associated with a deficiency or relative deficiency of nitrogen. Preliminary tests with liquid acid fertilizers in the case of leaf scorch and with calcium nitrate—ammonium sulphate not being available—in the case of little leaf seem to indicate that the trouble can be controlled by such cultural methods.

1226. Peyer, E. 634.8-1.8: 635.1/7
Zwischenpflanzungen und die praktischen Auswirkungen des Düngermangels im Rebbau. **(Intercropping and the effect of fertilizer shortage on viticulture.)**
Schweiz. Z. Obst- u. Weinb., 1943, **52**: 400-22.

The paper is the text of a lecture delivered at a meeting of the Association of Swiss Viticulturists in which the growing of vegetables in vineyards as an emergency measure was discussed. Although intercropping has been a general practice in several parts of Switzerland, it is not thought to be justified under normal conditions. Experiments conducted under the supervision of the Wädenswil Research Station showed that onions and garlic are especially suitable for cultivation in vineyards, and that leeks and celery are nearly as good. Carrots may be grown in young vineyards, whereas the cultivation of beans and potatoes is discouraged. The most favourable position of the vegetables in between the vines is described. In a second chapter the nutrient requirements of vines are discussed. Grafted vines especially are showing deficiency symptoms after their large yields and the drought of the last two years causing the roots to grow into the deeper layers. Cultivation must therefore aim at enriching the subsoil. Experiments showed that in times of manure shortage artificials may be applied alone for 5-6 years in loam and clay soils. Compost should be widely used as a substitute for manure. The ploughing in of certain leguminous crops sown in the autumn is warmly advocated in view of the favourable results obtained by this practice in the Moselle district. A survey of available fertilizers shows that nitrogen and potassium supply is sufficient and only phosphates are short. The pH value of the great majority of Swiss vine soils ranges from 7·5 to 8·5.

1227. Olmo, H. P. 634.8-1.521
Breeding new tetraploid grape varieties.
Proc. Amer. soc. hort. Sci. for 1942, 1942, **41**: 225-7, bibl. 6.

Ram, A. 634.8
Hints on the cultivation of grapes.
Punjab Fruit J., 1943, **7**: 1234-7.
For the amateur in the Punjab.

1228. Colby, A. S. 634.51
The Crath Carpathian walnut in Illinois.
Ill. Hort., 1943, **32**: 2:4-5.

Seeds from extremely frost hardy Persian walnut trees (*Juglans regia*) in the Carpathian Mountains were collected by the Rev. P. C. Crath in the early 1930's and planted in a nursery near Toronto. Seedlings were distributed throughout the northern states of the U.S.A. and some have been brought into bearing. The staminate catkins were noticed to appear at a later age than the pistillate flowers.

1229. Kline, L. V. 634.51
A method of evaluating the nuts of black walnut varieties.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 136-44.

A direct system whereby nut value is expressed in terms of

income-producing potentialities (earnings per hour for hand shelling) calculated by means of the equation

$$\cdot 0794\ (pK\text{-}N)\frac{W}{T}=e$$

where ·0794=a constant representing working speed and skill,

$$p=\frac{\text{weight of kernels recovered}\times 100}{\text{weight of nuts shelled}},$$

K=market value of kernels per lb., N=market value of unshelled nuts per 100 lb., W=weight of average nuts in grams, T=average time required to shell one nut in seconds, e=earnings per hour. The comparison of earnings per hour will permit the ranking of the different varieties.

1230. HANSEN, J. W. 634.51: 581.145.2
Surface area of Persian walnuts.
J. econ. Ent., 1943, **36**: 347.
A simple method is described for determining the surface area of Persian walnuts.

1231. GOSSARD, A. C. 634.521-1.536: 577.15.04
Root and shoot production by young pecan trees treated with indole-butyric acid at the time of transplanting.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 161-6, bibl. 2.
A field study on the effect on root and shoot growth of young Schley pecan trees treated at transplanting with indole-butyric acid was begun at the U.S. Horticultural Field Station, Meridian, Mississippi. Impregnation of the treated trees was carried out by the toothpick method developed by Romberg and Smith,* 4 toothpicks each containing 4 mg. of indolebutyric acid being inserted in the lateral and/or tap roots of each tree. The treated trees showed a significant increase of root but not of shoot growth. Trees with large well-branched root systems at transplanting made better top growth than those with less well developed roots.

1232. VAN HORN, C. W. 634.521: 581.144.4
Additional studies on delayed foliation of pecan trees.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 65-6, bibl. 1.
Dormancy was broken by spraying with 2-4-dinitro-6-cyclohexylphenol (DNO). The treatment compensates for some lack of chilling (see also *H.A.*, 12: 90).

1233. SUSLOVA, M. I. 581.192: 634.55 +634.574
The carbohydrate content in the leaves of almond and pistachio. [Russian.]
Proc. Lenin Acad. agric. Sci. Moscow, 1941, No. 11, pp. 36-9.
Leaves from *Pistacia vera*, *Amygdalus communis*, *A. brachiuca*, *A. bucharica* and *A. scoparia*, grown both on irrigated and non-irrigated plots, were analysed by Bertrand's method for their carbohydrate content at the Kurkmen station of the above institute in the city of Karakala. In *P. vera*, on non-irrigated plots, there was a gradual increase in the accumulation of the total store of sugars between May and September, the month to month variations being altogether slight. In May monosaccharoses (10·05%) preponderated over di- and polysaccharoses (0·72%), whereas in the autumn the figures were 5·78 and 6·24%. In almonds during May and June there was a decrease in mono- and disaccharoses and an increase in the starch content. It is explained that this is due to the weakening of the process of assimilation with a parallel rise in respiration occurring in the first (initial) phase of wilting. As early as June almonds exist under conditions of acute water deficit, for their roots do not go deeper than 80 cm. as against 140-150 cm. in the case of *P. vera*. The latter had, throughout the observation period, a higher store of carbohydrates than almonds. The increased rate of the storing up of sugars during hot months indicates that carbohydrates play an important part in enhancing the drought resistance of plants. The accumulation of monosaccharoses tends to increase the osmotic pressure; the latter, in its turn, facilitates absorption of water from the soil, hinders excessive transpiration and prevents the swelling of the cytoplasm. In trees grown on irrigated plots, the sum total of carbohydrates during summer and autumn was always lower than in those cultivated on non-irrigated ones. Thus in June and September *P. vera* leaves contained 7·40 and 6·41% of sugars as against 10·91 and 12·02% in the same period in the leaves of non-irrigated trees.
In general, plants under irrigation tend to produce large amounts of starch. The leaves of both irrigated and non-irrigated trees contained equal or greater amounts of soluble carbohydrates than those from plants growing in the sandy Kara Kum desert. At the same time, in plants growing on non-irrigated land the leaf proteins began to coagulate in June only at 57-68° C. as against 48-58° C. on irrigated plots.

* *Ibidem* for 1938, 1939, 36: 161-70; *H.A.*, 9: 843.

1234. SUSLOVA, M. I. 632.112: 634.574 +634.55
The ecology of *Pistacia vera* and different varieties of almond in relation to their cultivation on non-irrigated land. [Russian.]
Sovetsk. Botan., 1941, No. 1-2, pp. 95-102.
Observations have been made since 1930 by the Turkmen Experiment Station on the behaviour and reasons therefor of *Pistacia vera*, *Amygdalus communis*, *A. scoparia*, *A. bucharica* and *A. turcomanica* on irrigated and non-irrigated land in the dry valley of the river Sumbar at altitudes varying from 900 to 2,000 metres. Drought conditions are such that almonds normally shed their leaves and develop winter buds at the end of July on non-irrigated land. *P. vera* and *A. scoparia* showed the greatest resistance to drought conditions. The pistachio was found to have a root system which sometimes penetrated to a depth of 150 cm. in contrast to the common almond whose roots were never deeper than 80 cm. Under irrigation *A. communis* grew more quickly than the others examined.

1235. CHASE, S. B. 634.51
The influence of delayed hulling on the color and quality of eastern black walnut kernels.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 131-5, bibl. 4.

McKAY, J. W. 634.533
Self-sterility in the Chinese chestnut (*Castanea mollissima*).
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 156-60, bibl. 9.

PLANT PROTECTION OF DECIDUOUS FRUITS.

1236. MARTIN, H. 633/635
War problems and post-war responsibilities of the Association [of Applied Biologists].
Ann. appl. Biol., 1943, **30**: 109-16.
The address of the President of the Association of Applied Biologists delivered to the annual general meeting, 12 February, 1943. Mention is made at the outset of the work of the Biology War Committee which only came into being as a result of strong representations by the Association and allied Societies. With reference to the Agricultural Advisory and Research Services, though ignored when the implementation of agricultural policy was transferred to the County War Agricultural Committees and still unmentioned in the Ministry of Agriculture's "Notes on Agricultural Policy" issued in 1942, the Committees themselves were quick to recognize their potential value and in most counties to

recruit their services. The negotiations attendant on the birth of the scheme for the official recognition of proprietary pest control products are related and some difficulties of operation are pointed out. Problems in publicity are discussed. Attention is drawn, with examples, to the danger of ill-informed articles in the press, of misleading claims by advertisers and to the fact that, in spite of Ministry of Agriculture bulletins and the zeal of the press in combing all sources of reliable information, the results of research still do not get through to the grower in proper perspective. As regards the future the post-war responsibilities of science are immense, not only in safeguarding the nations against the misuse of its discoveries and in keeping itself free from exploitation, but also in ensuring that mankind shall profit by its impact. To achieve this the first step is the organization of individual effort in corporate manner. The speaker then outlined his suggestions for the post-war organization of science on a basal unification by means of subject groups interlocking the publishing societies, and an apical unification to a Science Council on which the sciences would be represented by election from the publishing societies. The extension of subject groups would be the responsibility of the individual scientist fostered by the society of which he is a member. In this reorganization the Royal Society and the British Association should take the lead. Among early problems to be tackled, preferably by the proposed Science Council, is the language of science. Its urgent task would be to guide the evolution and add to the precision of scientific language in strong collaboration, clearly, with authorities in other countries. In discussing the future ethics of science the need is stressed for a fundamental change in the status of science in education. The speaker would like to see a scientific training come to be regarded as indispensable as an intellectual discipline to all worthy positions of responsibility and to all who ask for an education in the art and understanding of life. The scientific hierarchy, too, must change their attitude towards the political responsibilities of science. Fears for scientific freedom from entanglement in politics have some grounds but are no reason for inaction. The necessity in many cases for scientific authors to get permission from their employers before publishing is condemned. In conclusion the speaker urged his hearers to accept the responsibilities which science must shoulder in post-war reconstruction.

1237. D'Oliveira, B. 632.3/4+632.8
A estação agronómica e os problemas nacionais de fitopatologia. (National problems of plant disease in Portugal.)
Rev. agron., Lisbon, 1942, **30**: 414-38.

National problems of plant disease in Portugal, of which there seem to be a great number, are discussed, partly with the object of convincing the layman that the old "cut and burn" attempts at disease control have passed away in favour of methods that are more effective. Suspicion and ignorance on the part of growers are formidable hindrances. An example of the advantages of intelligent co-operation is afforded by the National Olive Society which is subsidizing research on the diseases of this plant. Methods are indicated by which various problems could be tackled.

1238. Marchionatto, J. B. 632.3/4+632.8(82)
Las enfermedades de las plantas cultivadas de la Argentina y sus problemas. (Diseases of cultivated plants in Argentina and their problems.)
Chron. bot., 1942, **7**: 163-4.

1239. Bibikova, A. F. 634.1/2: 581.45: 632.111
A study of anatomical structure of fruit trees in relation to their frost resistance. [Russian.]
Sovetsk. Botan., 1941, No. 1-2, pp. 127-32.

Leaves of 8 different varieties of apple grown in the Krasnodar and Slavjonsk districts, on the heavy, clayey, degraded black earth soil and on the grey, light, clayey river valley soils were examined for the size of stomata and of cells in the upper epidermis. Knowledge as to their frost resistance —as derived from observations during severe winters and as recorded in the literature—shows the 8 varieties to possess winter hardiness in the following descending order: (1) White Astrakhan; (2) Red Astrakhan, Borovinka; (3) White Rosemary; (4) Winter Gold Pearmain; (5) London Pippin; (6) Reinette Champagne; (7) Wagner Prize; and (8) Reinette Simirenko. It was shown that the larger the stomata or cells in the leaves the greater was the frost resistance of the variety. This relation, found to be true in a lesser degree in old trees, was particularly noticeable in young plants. An examination of the anatomical structure of the lower surface of the leaves showed the existence of an analogous correlation between the size of stomata and cells on the one hand and the winter-hardiness of the variety on the other. These findings are illustrated by a number of tables and diagrams, and the conclusion is reached that this simple method of determining frost resistance should enable breeders to choose more readily varieties suitable for each climatic zone.

1240. Solov'eva, M. A. 634.1/2-2.111
Determination of the frost resistance of fruit trees. [Russian.]
Sovetsk. Botan., 1941, No. 1-2, pp. 133-44.

Two types of freezing chamber are described, one for testing cut branches in the laboratory and another, of slightly reduced dimensions, for direct application in the field. One-year-old branches of different varieties of apple and pear showed clear differences in the amount of injury when tested at temperatures of -15, -19 and $-20{\cdot}5°$ C. for six hours. The results obtained with the laboratory method agreed with those obtained in the field. The apple variety Antonovka was the least injured in all the experiments.

1241. Peyer, E. 634.8-2.13
Verhagelte Reben. (Hail damaged vines.)
Schweiz. Z. Obst- u. Weinb., 1943, **52**: 377-9.

Discussing the hail damage caused to vines in certain parts of Switzerland by a heavy storm in June the author states that rockets proved useless because they exploded much below the clouds. The following steps should be taken immediately after a hail storm early in the growing season to mitigate the damage: (1) Thorough spraying to control downy mildew; (2) the plant should be so treated that the vine and the remaining first buds are soon covered with healthy foliage; (3) top dressing of severely damaged but still cropping vines with 4-5 kg. calcium nitrate or 3 kg. ammonium sulphate per 100 m^2 immediately after the storm; (4) the coagulated soil should be cultivated or ploughed as soon as possible; (5) severe pruning in a case of total damage must be carried out at once to obtain few but strong shoots producing good wood for next year's pruning. Intensive mildew control is important.

1242. Stevens, E. N., and Thompson, N. F. 634.76-2.181
Factors influencing injury to cranberry plants during flooding.
Wis. Hort., 1943, **33**: 264-5, being abstract from *Trans. Wis. Acad. Sci.*, undated.

Injuries to cranberry plants during flooding were found to occur through lack of oxygen, carbon dioxide or light. It must be realized that higher water temperatures, desirable for their effect on pests, increase the metabolism of the plants and the amount of O_2 and CO_2 required. Especially the lower levels of reservoirs will be deficient in oxygen. The marsh should be flooded during one night or early morning and the water removed the following night or early evening.

1243. Moore, M. H., and Rogers, W. S. 632.112: 634.1/2
Sunscald of fruits.
A.R. East Malling Res. Stat. for 1942, A26, 1943, pp. 50-3, bibl. 1.
The same article as that referred to in *H.A.*, 13: 92 with added evidence of similar symptoms noted in 1931 on apples and of apple scald resulting from exposure to infra-red rays on picked Newton Wonder apples.

1244. Allmendinger, D. F., Overley, F. L., and O'Neill, W. J. 634.11-2.19: 632.95
Experts study apple sunburn. Is fluorine spray more to blame than lead arsenate ?
Better Fruit, 1943, **38**: 1: 56.
The authors studied the effect of different sprays on the extent of sunburn damage to apples. Light, light-medium and medium oils in combination with lead arsenate and light oils in combination with cryolite were tested throughout the season. The results, obtained at Washington Agricultural Experiment Station, Wenatchee, showed that the spray mixtures had no significant influence on the amount of sunburn.

1245. Siegler, E. A. 634.23: 581.144.2
Anatomical and other studies on Mazzard cherry seedlings having excessive roots at the collar region.
J. agric. Res., 1943, **67**: 1-16, bibl. 14.
Malformations characterized by an excessive number of roots at the collar region of Mazzard cherry seedlings were studied by the Bureau of Plant Industry, U.S. Department of Agriculture. Although the phenomenon slightly resembles the hairy root disease of apple, it was established by inoculation tests that *Phytomonas rhizogenes* causes the same symptoms in cherry seedlings as in apples and is therefore not responsible for the malformations under investigation. Neither was any other causal organism discovered. Anatomical studies, however, demonstrated that adventive primordia are most frequently formed in the hypocotyl during the early stages of secondary growth. The differentiation and development of such adventive primordia from derivatives of those regions of the cambium, which may be considered the least stabilized in producing vascular bundles, are illustrated in a series of clear photos.

1246. Strickland, A. G. 632.1/8: 634.1/7 + 634.8
Fruit trees and vines.
Fruit World, Melbourne, 1943, **44**: 7: 7.
Results obtained from the practical application by horticulturists of recent scientific discoveries in Australia were discussed at a conference of the Agricultural Bureau of Australia, River Murray Branch. Mottle leaf in citrus was cured by zinc sprays, but trees first treated (about 1935) showed signs of reversion. The treatment should be given every two or three years. Little leaf of peaches was cured by spraying with 50 lb. zinc sulphate per 100 gal. water for two years in succession. The treatment should be repeated in a few years. Zinc points, using 6 to 8 points for every inch in circumference of the tree, were more permanent but slower to take effect. The short life of peaches formerly attributed to irrigation in S. Australia was probably due to an unrecognized zinc deficiency. Little leaf of vines is best treated with 2 lb. of zinc sulphate per gallon of water, preferably applied to the pruning cuts immediately after pruning. Iron chlorosis of pear trees did not respond at Renmark to injections, but apparently worthless trees there made a remarkable discovery when the post hole method was tried. A circle of 8 equidistant holes 5 or 6 feet from the trunk was made with a post hole borer and ½ lb. of iron inserted in each hole. In the Adelaide plains a yellowing of citrus leaves was cured by treatment with manganese. Grape vine mite was suppressed by 1 in 15 or 1 in 20 lime-sulphur spray applied when the buds were swelling, and again at 1 in 60 when the shoots were a foot long. Apricot gummosis is increasing and is the subject of experiment, meanwhile a bordeaux spray immediately after pruning is advised. Fifty per cent. of an apple crop was saved in Balhannal last year by a hormone antidrop spray. It could be mixed with the last lead-arsenate spray. Hormone spray so far had been ineffective in preventing citrus fruit drop.

1247. Dippenaar, B. J. 632.19: 546.47 + 546.711
The control of deficiency diseases in plants.
Fmg S. Afr., 1943, **18**: 189-94.
Brief descriptions are given of the symptoms caused in the Western Cape Province by deficiency of zinc in fruit trees and manganese in plants of all kinds. Methods of correcting the condition are suggested.

1248. Goodall, D. W. 634.11-2.19: 581.192
Studies in the diagnosis of mineral deficiency. I. The distribution of certain cations in apple foliage in early autumn.
J. Pomol., 1943, **20**: 136-43, bibl. 8.
Samples were taken of apical, middle and basal leaves from primary long shoots, from primary non-bearing spurs, and from secondary spurs on bearing spurs of trees of Cox's Orange Pippin apple on Malling rootstock XII. The trees were receiving eight different manurial treatments. The samples were analysed for calcium, iron, magnesium, manganese and potassium. Samples from plots receiving double potash applications contained 58% more potassium than those from plots receiving a single application; samples from plots receiving sulphate of ammonia contained 42% more manganese than those from the no-nitrogen plots. The potassium content was highest in leaves from the middle and apex of the long shoots; the content of the other elements was highest in the basal leaves of the non-bearing spurs. In general, for all elements except potassium, the content declined as the date of leaf formation became later in the season, but rose slightly again at the end of the season. Differences in manganese and potassium status of different trees are reflected more clearly in the composition of the basal leaves of the non-fruiting spur than in that of the other leaf types investigated. [Author's summary.]
Some practical conclusions to be drawn from these results are the importance, in comparing assessments of nutritional levels between trees, that the sample leaves should be of the same type and that the most promising type of leaf for the purpose is the basal leaf of the non-fruiting spur. The experiments are being extended to cover other seasons of the year and possibly other nutritional elements.

1249. Alben, A. O., Hammar, H. E., and Sitton, B. G. 634.521-2.19
Some nutrient deficiency symptoms of the pecan.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 53-60, bibl. 2.
The results are discussed of nutrient deficiency experiments with Burkett and Stuart varieties of pecan carried out by the U.S. Department of Agriculture in Lousiana. There has been little previous work on the subject. The trees, one of each varlety for each treatment, were grown in washed sand in 55 gal. steel drums, the roots were 4 years old from seed and the tops had grown one year from scion bud. *Deficiency symptoms : Nitrogen.* Leaves changed from dark green to light green and yellow according to severity of deficiency. Reddish-brown necrotic spots appeared on the yellow leaves which later fell prematurely. Leaf size became smaller with successive years and there was much dieback of shoots, beginning in the upper branches. *Phosphorus.* Leaves from bright glossy green changed to dull green and then to yellow. Interveinal necrotic areas occurred and coalesced involving a large part of the leaf, which then soon dropped. Shoot growth was short and thin. *Potassium.* Leaves presented a bronzed appearance with, later, numerous minute reddish necrotic spots. Acute deficiency symptoms were loss of green colour in patches followed by necrosis of all or sometimes only the older

leaves on a rachis. Shoot growth was unaffected the first season but weakened later; there was little defoliation. The Burkett tree also exhibited pronounced leaf curl. *Magnesium.* The Burkett tree showed acute leaf bronzing, with necrotic areas but no chlorosis, every leaf being affected; defoliation followed. New leaves showed water soaked areas which coalesced, turned brown and became necrotic. In Stuart there was chlorosis between the secondary veins of young leaflets with dwarfing, not observed on the older leaves. Other symptoms were those characteristic of Mg deficiency in many other crop plants. *Calcium.* Leaves somewhat chlorotic and mottled, slightly wavy and with shortened rachis, causing overlapping. Leaves never grew to normal size. *Boron.* The leaves went through the following series of changes as deficiency increased. Water-soaked areas turned through purple to reddish-brown. Spots became more numerous but no larger. Distal leaves became smaller and chlorotic. Shoot development was curtailed, the shoot becoming progressively weaker towards the tip with shortened internodes eventually bearing only rudimentary leaves. The Burkett tree showed no mild deficiency symptoms but developed severe rosetting. *Sulphur.* In the main similar symptoms for both varieties. Younger leaves and later older ones gradually lost colour, beginning at the sides of the midrib and secondary veins and extending towards the interveinal area producing a mottled appearance. Dwarfing and mottling were always more pronounced on the younger leaves.

1250. Meier, K. 632.191: 634/635
Über Gelbsucht an Obstbäumen, Reben und Gartenpflanzen. **(Chlorosis of fruit trees, vines and garden plants.)**
Schweiz. Z. Obst- u. Weinb., 1943, **52**: 337-44.
The symptoms of chlorosis caused by chemical deficiencies and physical soil conditions are described.

1251. Meier, K. 634.8-2.191
Untersuchungen von Rebböden mit gelbsüchtigen Reben in Rickenbach, Kt. Zürich. **(Tests of vine soils in which vine chlorosis has been evident at Rickenbach, Canton Zürich.)**
Schweiz. Z. Obst- u. Weinb., 1943, **52**: 385-92.
During the investigation of chlorosis in certain Swiss vineyards many soil samples were tested for available phosphoric acid, potassium and boron at Wädenswil. There was no deficiency which could account for the disorder. It is suggested that the vines were planted too deep for the heavy soil, resulting in a lack of roots in the upper layers and in bad aeration which in turn leads to the dying off of roots. A number of plants with strong roots in the upper soil layers arising from the scion remained normal.

1252. Bryant, L. R., and Gardner, R.
634.13-2.19: 631.85
Phosphorus deficiency in pears.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 101-3, bibl. 2.
Phosphorus deficiency symptoms reported from a pear orchard in Colorado included severe burning of the margins and tip halves of leaf blades early in the season, a decrease in leaf size, failure of fruit to develop properly, very short terminal growth, a scaly appearance of the bark and a dying back of the new growth. The trees recovered as the result of applying phosphates and improved on the addition of sulphur alone, probably as a result of the decreased alkalinity induced by its addition and the consequent increase in available phosphorus in the soil.

1253. Duggan, J. B. 634.23-2.19: 546.711
A promising attempt to cure chlorosis, due to manganese deficiency, in a commercial cherry orchard.
J. Pomol., 1943, **20**: 69-79, bibl. 15.
Manganese deficiency was diagnosed by spectrographic analysis and confirmed by the results of shoot injection and soil analysis as being the cause of ill-health of certain cherry trees growing on a shallow, eroded, badly drained, sandy clay-loam in a Kent orchard. Slight but insufficient improvement was obtained by spraying the trees and by injecting branches and whole trees with solutions of manganese sulphate. Injection of large branches and trunks with solid manganese sulphate fully restored the green colour to the leaves and was followed by a marked increase in growth and cropping which, it is hoped, will last at least 4 years without further treatment. The method of solid injection used, reduced after several seasons' experiment to the simplest form compatible with efficiency, was to insert tablets of dry manganese sulphate $\frac{1}{4}$ in. in diameter and $\frac{1}{2}$ in. long, weighing 1 g., into holes drilled with a $\frac{1}{2}$-in. Irwin bit and spaced round the trunk at intervals at any convenient height. One hole was allowed for each inch of diameter of the trunk, the holes being closed with corks after insertion of the tablet. Unsatisfactory results were obtained when the prescribed dosage was reduced.

1254. Epstein, E., and Lilleland, O.
634.1/2-2.19: 546.711
A preliminary study of the manganese content of the leaves of some deciduous fruit trees.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 11-8, bibl. 6.
Manganese deficiency symptoms in peach in Californian orchards could generally be associated with a manganese content of less than 17 parts per million, but did not affect growth, yield or fruit size. Many samples contained as much as 292 parts per million manganese on a dry weight basis. Studies of fruit trees growing in the same soil gave in parts per million manganese: filberts, 494; walnuts, 246; almonds, 96; apple, 81; prune, 73; peach, 66; pear, 63; cherry, 63. Analyses of chlorotic leaves of species from various soils gave: apple, 5 parts per million manganese; apricot, 9-14; cherry, 21; peach, 7-16; prune, 15; walnut, 6-25. Chlorotic conditions were cured by various forms of injection with manganese. Neither pH nor total manganese content of the soil could be correlated with manganese content of peach leaf.

1255. Southwick, L. 634.11-2.19: 546.46
Magnesium deficiency in Massachusetts apple orchards.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 85-94, bibl. 11.
In addition to the normal scorch in such cases in magnesium deficient orchards other symptoms included yellow banding and mottling of leaves, abnormally early and sudden leaf-fall of the older affected leaves and increased preharvest drop of fruit. Symptoms varied with different varieties. Thus in glasshouse-grown Malling IV stocks typical leaf edge burn occurred, but the scorch in Malling V stocks was largely internal in character. Chemical analysis showed a consistent correlation between symptom severity and the content of magnesium and potassium. The data suggested strongly that potassium manuring increased the possibility of increased prevalence and severity of magnesium deficiency symptoms. The Mg-deficient soils were quite acid and contained very small amounts of exchangeable magnesium. Chemical analysis of leaves appears to offer an accurate method of determining the magnesium status of apple trees and the need for remedial measures.

1256. Boynton, D., Cain, J. C., and Van Geluwe, J.
634.11-2.19: 546.46
Incipient magnesium deficiency in some New York apple orchards.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 95-100, bibl. 3.
A report of studies on an interveinal leaf blotch in several New York orchards. The symptoms are described. Of the remedies attempted injection appeared to be of value for diagnosis but unsatisfactory as a method of cure, partly

owing to the danger from small overdoses and partly to the lack of carry-over effect from one year to another. Spraying with Epsom salts solution gives promise of at least temporary control in orchards showing moderate leaf blotch. Results from soil application of commercial magnesium sulphate have been variable.

1257. ADAM, W. B., AND DICKINSON, D. 634.22-2.19: 546.27
Fruit gumming of Victoria plums. Progress report IV.*
A.R. Campden Fruit Vegetable Pres. Res. Stat. for 1942, 1943, pp. 27-32, bibl. 5.

Trials at Campden showed that although 2 to 4 parts per million of boron were taken up by the leaves, fruit and stones, no material reduction in gumming either the same year or the next was induced by treating the soil under Victoria plum trees with 4 to 5 oz. of borax in April. There was no evidence to show that gumming is related to weight of crop or size of plums. The degree of gumming is positively correlated with the rainfall in the latter part of the growing period, i.e. July and August.*

1258. TINDALE, G. B., AND HUELIN, F. E. 634.11-2.19
Bitter pit in Granny Smith apples.
J. Dep. Agric., Vict., 1943, **41**: 246-50.

Studying bitter pit in Granny Smith apples from an orchard at Croydon, Victoria, in relation to post-harvest treatment, the fruits were subjected to various storage conditions for 4 successive years. Three pickings were made each year at fortnightly intervals starting about 1 April. Late picking combined with immediate cool storage controlled bitter pit almost completely in 1938, '39 and '40 and partially in 1941. Late picking by itself did not reduce the trouble in 3 of the 4 years. Keeping the apples at 60°-70° F. in delayed storage trials increased the disorder only slightly as compared with a pre-storage temperature of 40°-50° F. Delayed storage, shortening storage life and favouring bitter pit development, should not be applied as a control measure for superficial scald. A small-scale coating experiment—dipping the apples in an alcohol solution containing 10% castor oil and 5% shellac—gave promising results. A comparison of rainfall figures and storage pit suggests that drought may be a cause of this disorder.

1259. BRITTON, J. E., FISHER, D. V., AND PALMER, R. C. 634.11-2.19
The influence of some horticultural practices on bitter pit in Okanagan-grown apples.
Sci. Agric., 1943, **23**: 651-75, bibl. 21.

Serious losses from bitter pit having been reported for Okanagan grown Cox's Orange, Northern Spy and Newtown apples, the disorder was studied for several years at the Dominion Experimental Station, Summerland, B.C. Environmental conditions in the whole area seem to be responsible for the trouble in the first two varieties mentioned, losses amounting annually to 20% of the whole crop and to 55% in some places, whereas with Newtown losses were about 5%, varying greatly from orchard to orchard and season to season. The most interesting result reported is the observation that apples from trees carrying less than a third of a full crop are liable to develop bitter pit, regardless of harvesting and storage method. The authors therefore strongly recommend the segregation of fruit from light and heavy crop trees in order to avoid repacking at a later stage. Although apples from light crop trees mature earlier than those from normal trees, the authors advise that they should be picked, if possible, after the main crop, since the longer they are left hanging on the trees the less susceptible do they become to bitter pit, brown core and scald. Losses from heavy cropping trees could be considerably reduced by picking at the proper maturity, as indicated by maturity tests, and to a lesser extent by immediate storage at 32° F. After 2 months' storage symptoms of bitter pit became externally visible. The development of the disorder in the Newtown variety appeared to be connected with seasonal weather conditions, since after great susceptibility in the years 1937-40 losses were negligible in 1941 and '42. The literature bearing on the subject is reviewed.

1260. WYND, F. L. 581.192: 632.8
Metabolic phenomena associated with virus infection in plants.
Bot. Rev., 1943, **9**: 395-465, bibl. 146.

Reviewing the literature the author records two major effects of virus infection on the metabolism of plants associated with respiration and permeability of the cytoplasm. Respiration is distinctly activated when the virus reaches the tissue, but the initial increase is generally followed by a decrease below or approximately to the normal level while the virus material accumulates during the progress of the disease. Oxygenase and peroxidase activities increase after some time, preliminary and later stages showing reduced activity. Catalase activity increases during the early stages of infection. In tobacco this increase is followed by a progressive decrease. The generally observed accumulation of carbohydrates in the leaves is probably caused by reduced permeability to sugar, in-some cases phloem necrosis may play an additional part. Reduced permeability is also responsible for accumulation of nutrient materials in the roots and for the inhibition of salt movement from storage tissues. Differential ion absorption accounts for the widely deviating ratio of single nutrient components to the total ash, indicative of a significant change in the nutritional state of the plant. The most marked divergence is the decrease in calcium, whilst the Mg: ash ratio increases as calcium decreases. The total amount of nitrogen is usually smaller and the protein: non-protein N ratio is lower. Diseased plants show a reduction in total ash.

1261. HOCKEY, J. F. 634.11-2.8
Mosaic, false sting, and flat limb of apple.
Sci. Agric., 1943, **23**: 633-46, bibl. 8.

Mosaic, false sting and flat limb, found to cause damage in Nova Scotia apple orchards, were studied at the Dominion Laboratory of Plant Pathology, Kentville, Nova Scotia. The symptoms of mosaic are yellowish to cream spots on the leaves, leading to partial defoliation of the trees as the season advances. The disease was observed on a great number of apple varieties and was easily transmitted by grafting. Other methods of transmission, including transfer of aphids, failed. Although the crop seems only slightly reduced by the virus, eradication of affected trees in view of possible future developments and careful selection of scions are advocated as control measures. False sting, another virus disease of many varieties transmittable by grafting, produces depressions on fruits resembling injury by capsids in connexion with distortion of vascular bundles. The above mentioned measures are recommended also for the control of false sting. Flat limb occurs mainly on Gravenstein; it is characterized by a slight depression of 2-3-year-old branches which becomes conspicuous as the branches grow older. Black heart frequently accompanies the flat limb condition. Although transmission of the disease by grafting was successful in less than 50%, topworking of normal Gravenstein on the varieties Dudley and Crimson Beauty often produced the abnormality in the subsequent growth of the scion. The fact that root grafts produced less flat limb than stock grafts and that free growing E.M. type XII roots were not so favourable to its development as E.M. type IX roots supports the theory that the root-scion relationship may be regarded as the initial cause of flat limb. Excellent photos illustrate the symptoms of all three diseases.

* For I, II and III, see *H.A.*, 8: 1316; 10: 1528; and 11: 1470.

1262. KEITT, G. W., AND CLAYTON, C. N. 634.23-2.8
A destructive virus disease of the cherry.
Phytopathology, 1943, **33**: 449-68, bibl. 22.
A progress report, 1936-40, of an investigation carried out in Wisconsin on virus disease of sour cherry (*Prunus cerasus*) tentatively named cherry yellows. Affected trees have relatively large leaves which develop large chlorotic areas and are shed 3 or 4 weeks after petal fall. Though the disease is not fatal, it results in reduced spur formation and smaller crops. It can be regularly transmitted by budding. The vectors as far as the investigations have gone appear to be leaf hoppers (*Cicadellidae*). Tests with the black cherry aphis, *Myzus cerasi*, gave negative results.

1263. BLODGETT, E. C. 634.23-2.8
Rasp leaf of cherry.
Phytopathology, 1943, **33**: 620-2, bibl. 2.
Rasp leaf of cherry* (illustrated) is caused by a virus transmitted readily by bud inoculation. The disease at present has no commercial importance, at least in Idaho, and no natural spread has been reported.

1264. HARRIS, R. V., BRYCE, A. D., AND FOISTER, C. E. 634.711-2.8
A leaf curl disease of raspberry in Scotland.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 48-9.
A recently identified virus disease is described as it occurs on Norfolk Giant raspberry in Angus and Perthshire and precautionary measures affecting planting and propagation are suggested.

1265. STANLEY, W. M. 632.8
Viruses and the electron microscope.
Chron. bot., 1943, **7**: 291-4, bibl. 35.
WOODS, M. W. 581.12: 632.8
Respiration and virus diseases.
Chron. bot., 1942, **7**: 243-4.

1266. DOWSON, W. J. 632.3
Bacteria which cause disease in plants.
Chemistry and Industry, 1943, **62**: 163-4, bibl. 5.
Some account is given of the bacteria injurious to plants in a paper read before a joint meeting of the Microbiological Panel of the Food Group of the Society of Chemical Industry and the Society of Agricultural Bacteriologists. Of the main groups into which bacteria are divided, spherical, rod-shaped and spiral forms, only the rod-shaped attack plants. The rod-shaped bacteria are divided into many sub-groups according to morphological features and staining reactions, of which 3 interest the plant pathologist. They are the colon-typhoid-dysentery group, the green fluorescent group and the diphtheroids. Only one of the rod-shaped bacteria which attack plants is slightly pathogenic to man, namely *Pseudomonas aeruginosa* (*Ps. pyocyanea*), the cause of blue pus; a variety of this species produces a serious disease in lettuce. Four main types of disease are produced: (1) vascular, in which the water conducting tissues are invaded (e.g. black rot of cabbage); (2) the parenchymatous, in which the softer tissues of the storage organs such as bulbs and tubers are rotted (e.g. black leg of potatoes and canker of stone fruit trees); (3) vascular-parenchyma, attacking the vessels and spreading to parenchymatous tissues such as the cortex (e.g. halo blight of beans); (4) hyperplastic, resulting in the formation of galls, tufted roots or shoots (e.g. crown gall). A brief account is given of some of the pathogens within these groups. In the discussion which followed the need for a uniform system of bacterial nomenclature was stressed.

* Also *ibidem*, 32: 333-5; *H.A.*, 13: 99.

1267. D'OLIVEIRA, M. DE L., AND CABRAL, R. V. DE G. 632.3
Doenças baoterianas das plantas, diagnosticadas em Portugal. **(Some bacterial plant diseases in Portugal.)**
Rev. agron., Lisbon, 1942, **30**: 176-84, bibl. 11.
The bacterial diseases discussed are: Olive scab (*Phytomonas savastanoi*); privet leaf spot (*Bacterium ligustri*); black-leg of potato (*Erwinia phytophthora*); root rots of various plants of which *Erwinia carotovora* is taken as the type; bacterial pod spot of beans (*Phytomonas phaseoli*); bacterial blight of walnuts (*Phytomonas juglandis*); black spot of lemon (*Phytomonas syringae*); begonia leaf spot (*Bacterium begoniae*).

1268. MONTGOMERY, H. B. S., MOORE, M. H., AND HOBLYN, T. N. 634.22-2.314
A field trial of measures designed for the control of bacterial canker of Victoria plum trees.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 53-61, bibl. 5.
The control of bacterial canker on Victoria plum trees was attempted using different trees to form the stem and crotch, different dates of pruning and varying applications of bordeaux mixtures. The use of Myrobalan B, Warwickshire Drooper, Utility and President for stems and crotches was very successful in preventing the occurrence of stem cankers. It was found that in these same trees there were just as many cankers in those pruned in May as in those pruned in October. Incidentally the May pruned trees were smaller and heavier cropping than the October pruned trees. Spraying stems and crotches with bordeaux 10: 15: 100 in October for the first 4 years after planting did not control the disease. Foliage sprays of bordeaux 4: 6: 100, especially when applied 3 weeks after petal fall and later, appreciably controlled the shot hole stage of the disease and reduced the number of branch cankers. It did not appreciably reduce the number of stem cankers.

1269. WORMALD, H. 634.23-2.3
Bacterial diseases of acid cherry trees.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 61-2.
The incidence of bacterial diseases on acid cherries in Kent is noted and descriptions are given of two organisms, one of them probably being identical with *Pseudomonas morsprunorum*. They are distinguishable by their cultural characters. They have been isolated from leaf spots, wilted blossoms, fruit and fruit stalks. One of them also infects branches and stems.

1270. RIKER, A. J., AND BALDWIN, I. L. 632.3
Names for the bacterial plant pathogens.
Chron. bot., 1942, **7**: 250-2.

1271. MONTGOMERY, H. B. S., AND MOORE, M. H. 634.1/7-2.1/4
Some fruit diseases seen on survey in Kent.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 104-7.
The incidence of and remedies for the following diseases noted during a fruit survey are discussed:—apple scab, pear scab, apple canker, *Armillaria* root rot, brown rot blossom wilt and canker, bacterial canker of cherry and plum, raspberry cane blight, currant leaf spot and waterlogging.

1272. HAMILTON, J. M., AND WEAVER, L. O. 632.4: 582.8
Freezing preservation of fungi and fungus spores.
Phytopathology, 1943, **33**: 612-3.
The sporidia of *Gymnosporangium juniperi-virginianae* and the conidia of *Venturia inaequalis* are used as test fungi in a method of evaluating fungicides. A readily available source of inoculum can be provided throughout the year by a new technique involving the quick-freezing and storage at

low temperatures of the galls and conidia. The sporidia obtained from the frozen galls were as viable as those obtained from galls taken from the field, while the conidia of *V. inaequalis* germinated well after having been frozen for more than 15 months. They were, however, more readily inhibited by fungicides than fresh-borne conidia. The procedure has likewise been successful with the conidia of *Sclerotinia fructicola* and *Plasmopara viticola*.

1273. WORMALD, H. 634.1/2-2.4
Papery bark canker of fruit trees in relation to silver leaf disease.
J. Pomol., 1943, **20**: 144-6, bibl. 7.

In papery bark canker of fruit trees the bark flakes off in the form of a loose papery membrane. It occurs frequently on apple trees which have been cut back and top-grafted, an operation carried out in spring when sap flow is abundant and the atmospheric humidity is high. The condition arises because the cortical cells contain a superabundance of water and collapse, the contents dry and form a powdery layer interrupting continuity between the tissues on their outer and inner sides; the outer tissues thus set free form the papery bark. Isolations from a number of grafted trees showing papery bark all yielded *Stereum purpureum* (silver leaf) and in one case *Polystictus versicolor*, usually considered a saprophytic species. Frameworked fruit trees are less subject to papery bark and therefore to risk of silver leaf than those which are top-grafted.

1274. BJÖRLING, K. 634.11-2.4
En kräftliknande sjukdom på äppleträd, förorsakad av *Myxosporium mali* (Bres). **(A canker-like disease on apple trees caused by *Myxosporium mali* (Bres).)**
Växtskyddsnotiser, 1943, Nr. 3, pp. 4-8.

The incidence of a canker-like disease on 60 out of 252 trees was reported to the Alnarp branch of the Swedish Plant Protection Station from a young apple orchard at Åkarp in May 1942. The causal fungus was identified as *Myxosporium mali*, recorded for the first time in Sweden. The symptoms of the disease are reminiscent of the superficial bark canker, the initial stages of these two forms of canker being discernible only under the microscope. In order to determine whether *Myxosporium* is a primary parasite 30 inoculations were made on 6 trees, 15 on the uninjured bark and 15 after scraping off the outer layer. Only two of the latter infections made on branches, which had previously suffered from frost damage, produced bark canker. It is concluded from these results that *Myxosporium* only attacks trees the resistance of which has already been weakened. This view was supported by further observations made in the same orchard in April 1943, when 30 trees planted the autumn before developed the disease. 27 of them were Bramley's and Ontarios on East Malling stocks II and IV respectively. On digging out three of the most severely damaged trees it was found that the roots were suffering from a bad attack of root canker caused by *Pseudomonas tumefaciens*. The owner stated that the majority of the trees were affected by root canker when planted. Scraping the diseased parts and wrapping the wound in paper led to complete recovery from *Myxosporium*.

1275. WILKINSON, E. H. 634.11-2.482
Dry eye rot of apples caused by *Botrytis cinerea* Pers.
J. Pomol., 1943, **20**: 84-8, bibl. 8.

The apple disease known as dry eye rot is attributed, as a result of isolation and infection experiments (described), to *Botrytis cinerea* Pers. The disease can only occur through calyx injury and its progress towards complete soft rot of the fruit is often checked by a change from high to low atmospheric humidity.

1276. MCKAY, R. 634.11-2.42
Notes on apple scab in 1942.
J. Dep. Agric. Éire, 1943, **40**: 129-33.

Referring to previous reports on his experiments (*ibidem*, Vols. 35, 36 and 39) carried out at University College, Dublin, the author records his apple scab spraying results in 1942. Lime-sulphur gave satisfactory control in spite of a wet season. There was a considerable difference in the percentage of scab-free fruits between trees sprayed for the first time and trees treated regularly in preceding years in favour of the latter.

1277. HAMILTON, J. M., PALMITER, D. H., AND MACK, G. L. 634.11-2.42
Particle size of sulphur and copper fungicides in relation to apple scab and cedar-apple rust control.
Phytopathology, 1943, **33**: 533-50, bibl. 19.

The fungicidal effectiveness against *Venturia inaequalis* and *Gymnosporangium juniperi-virginianae* and *Sclerotinia fructicola* (brown rot) of ground wettable sulphur and an insoluble copper was found inversely proportional to the size of the particles. One factor responsible for the increased control obtained with the smaller particle sizes is shown to be their greater adherence under weathering. Although differences in amounts of sulphur retained are small they are believed to be sufficient to make the difference between infection and control. The factor of particle size did not affect the amounts of the original deposits. A second factor providing increased control was found in laboratory experiments to be the greater toxicity of the smaller particle sizes presumably because of the larger surface area exposed to the water film in which the spores must germinate. The fact that for a given weight of material there are many more particles per unit area for a fine powder than for a coarse one is well illustrated in a series of photomicrographs.

1278. HARRAR, J. G., AND MENZIES, J. D. 634.13-2.3/4 +2.8
Diseases of pears in Washington.
Pop. Bull. Wash. agric. Exp. Stat. **171**, 1943, pp. 31.

This bulletin is a summary of present knowledge on the cause and control of pear diseases occurring in Washington. Parasitic diseases caused by fungi and bacteria as well as by virus and non-parasitic diseases are thoroughly and clearly dealt with.

1279. WORMALD, H. 632.4: 634.22 +634.23
Field observations on the *Cylindrocladium* shoot wilt of plum and cherry layers.
J. Pomol., 1943, **20**: 80-3, bibl. 5.

A wilting of shoots, which has taken very serious toll in the layer rows of plum and cherry varieties raised for rootstocks, has been traced to a fungus at present considered to be a cultural variety of *Cylindrocladium scoparium* Morgan. Control measures are based on the assumption that the parasite is a soil organism, since it has not been seen on the aerial parts of the plant, and on the fact that young shoots only are affected. If these survive, they can be planted out without fear of future infection. New layer beds should not be formed with material from an infected site, but if this is unavoidable the rootstock material must be clean washed and dipped in a fungicide before planting. If time allows, cuttings of such varieties as root easily, taken from the aerial parts of shoots, might be rooted in sterilized soil and then planted out to form the nucleus of a fresh set of layers for future propagation. It is noted that the dipping of the roots in a fungicide is at the moment of writing an untried suggestion only. Fungus and symptoms are described.

1280. WILSON, E. E. 632.4: 634.21 +634.55
Tests of eradicant sprays for use against *Sclerotinia laxa* and *Coryneum beijerinckii* in apricots and almonds.
Phytopathology, 1943, **33**: 506-16, bibl. 2.

Of 41 materials tested in California for ability to eradicate the holdover stage of *Sclerotinia laxa* and *Coryneum beijerinckii*

from apricot and almond trees only 6 showed promise. These were 0·5% and 0·3% solutions of sodium dinitro-o-cresylate (Elgetol) and 1% solution of sodium tetrachlorophenate, sodium pentachloro-phenate, sodium orthophenylphenate, tetrachloro-p-benzoquinone and 4-chloro-1, 2-benzoquinone dioxime. Unless, however, these materials are rendered more capable of penetrating the conidial masses on the sporodochia of *S. laxa* and of entering the tissues and killing the mycelium of *S. laxa* and *C. beijerinckii* in the diseased twigs they will not be of great use. [From author's summary.]

1281. (MARKIN, F. L.) 634.73-2.3/4
Blueberry diseases in Maine.
Bull. Maine agric. Exp. Stat. **419**, 1943, pp. 23, bibl. 38.

Trials of fungicides were carried out by the Maine Experiment Station on their experimental plots in different places in the years 1931-1935, following a survey of symptoms and incidence of the chief blueberry diseases in Maine, such as witches' broom, leaf rust, powdery mildew, and of less important diseases, such as red-leaf, *Sclerotinia* shoot blight and fruit-rot, *Botrytis* blossom-blight and fruit-rot. Copper lime, consisting of 25% monohydrated copper sulphate and 75% hydrated lime, was better than bordeaux mixture, lime-sulphur, sulphur, Oxo-bordeaux, copper cyanamid and copper carbonate. Though arsenic dusts were found not to cause leaf injuries, as commonly thought by growers, they aggravated already existing minor injuries. Trials with a combination of copper lime and tri-calcium arsenate proved this copper-lime-arsenic dust even superior in the control of both fungus and insect damage to either component by itself, thus indirectly reducing arsenical injury to a great extent. Where diseases cause leaf injury and premature defoliation dusting should be applied when about 80% of the blossoms have fallen and a second time 10-14 days later, at a rate of 10 lb. monohydrated copper sulphate per acre. Dusting is most effective when the leaves are moist; they should be evenly covered with a light, visible coating of dust. Blueberry plantations directly on the sea shore in Washington County suffered so little from leaf injuries that treatment was unnecessary. Among cultural control measures pruning of diseased high-bush blueberry plants, eradication of neighbouring fir trees and destruction of infected low-bush plants by fuel oil were recommended for the control of witches' broom. 16 plates illustrate the text.

1282. ANDERSON, H. W., AND COLBY, H. S. 634.8-2.4
Dead arm disease of grape.
Ill. Hort., 1943, **32**: 3: 3-4.

A severe outbreak of dead arm disease of grape occurred at the Illinois Station vineyard, Urbana. The susceptibility of 56 varieties to the disease was recorded, the record being based on the amount of spotting on 1943 shoots.

1283. HAMM, P., MITCHELL, J. E., AND GOTTLIEB, D. 632.4 + 582.8
A reflector scale for measuring growth of fungi.
Phytopathology, 1943, **33**: 619-20.

1284. MASSEE, A. M. 632.6/7: 634.1/7 + 633.79
Notes on some interesting insects observed in 1942.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 64-8.

The insects noted are: *Rhynchites aequatus* and *Anthonomus pomorum* on apple, *Otiorrhynchus singularis* on hops, *Phaedon tumidulus* on carrots, *Lampronia rubiella* on raspberries, *Cidaria truncata* on strawberry, *Lophopteryx camelina* on apple, *Taeniocampa opima* on loganberries, *Anthophila pariana* on apples, caterpillars of the winter moth group in orchards and nut plantations, *Megachile* spp. in hollow shoots of a decayed plum tree, *Hoplocampa flava* on plums, *Tomaspis sanguinea* on cherry and on hops, *Piesma capitata* on apple, *Hyalopterus arundinis* on plum, *Macrosiphum gei* on strawberry, *Forficula auricularia* on hops, *Aphelenchoides ribis* on black currants, *Oligonychus ulmi* in orchard and hedgerow, *Hemitarsonemus latus* on potatoes, *Phyllocoptes fockeui* on cherry and *Phytoptes phloeocoptes* in West Country plum orchards.

1285. GARMAN, P. 634.11-2.6/7
Studies of reduced schedules for control of apple insects in Connecticut.
J. econ. Ent., 1943, **36**: 211-4.

At the Connecticut Agricultural Experiment Station, New Haven, the problem of lowering production cost by reducing spray schedules for the control of apple insects has been studied since some time before the war. Very good preliminary results were obtained with aluminium acetoborate or aluminium aceto-formate, oil and benzoic acid as stickers. Laboratory tests on glass slides showed that the aluminium compounds formed gels with good adhesive properties. Aluminium not being available now, silica gels were demonstrated later to have the same desirable properties. Lime added to talc was also found to improve the sticking quality of spray mixtures. Aluminium aceto-borate and aluminium aceto-formate, used in combination with lead arsenate, resulted in much reduced foliage injuries and fruit russet. The introduction of lime-sulphur as a fungicide in combination with lead arsenate, soybean flour and manganese borate has proved very satisfactory on McIntosh and Baldwin. It is pointed out that the lime-sulphur thus used may also be of value to the trees as a fertilizer.

1286. KING, H. L., AND FREAR, D. E. H. 632.654.2
Relation of chemical constitution of some N heterocyclic compounds to toxicity to *Tetranychus telarius* (L.).
J. econ. Ent., 1943, **36**: 263-5, bibl. 5.

Investigations at the Pennsylvania Agricultural Experiment Station into the toxicity to the red spider, *Tetranychus telarius*, of 8 N heterocyclic compounds related to pyridine revealed a definite relation between chemical constitution and toxic effect.

1287. NEWCOMER, E. J. 632.654.2: 634.11
Apparent control of the Pacific mite with Xanthone.
J. econ. Ent., 1943, **36**: 344-5.

An infestation of the Pacific mite, *Tetranychus pacificus*, occurred in 3 apple orchards near Yakima, Wash., used in 1941 for codling moth control experiments by the Bureau of Entomology and Plant Quarantine. Observations during 2 seasons showed infestations in trees sprayed with xanthone to be only half as heavy as those in trees sprayed with lead arsenate of phenothiazine.

1288. NICKELS, C. B. 634.521-2.654.2
Two economic species of mites on pecan.
J. econ. Ent., 1942, **35**: 948, bibl. 2.

The mites *Eriophyes caryae* and *Paratetranychus viridis* cause serious injury to pecans in Texas. Where clean weeding was practised injury was not observed.

1289. WIESMANN, R. 634.75-2.654.2
Untersuchungen über die Biologie und Bekämpfung der Erdbeermilbe *Tarsonemus pallidus* (*fragariae Z.*) Banks. **(Biology and control of the strawberry mite (*T. pallidus*).**
Reprinted from *Landw. J. Schweiz*, 1941, **55**: 259-329, bibl. 39.

Investigating life history and control of the strawberry mite at Wädenswil the author found that a great number of females hibernate in between the youngest leaves in the centre of the plant. Only about 5% of the mites survive till spring. Reproduction reaches its climax in July-August, when also the greatest damage is done, appearing as leaf curl. Infection spreads across the stolons from plant to plant and over great distances through the transplanting of runners. Application of 2 vol. % methyl bromide (20 g.

per m³) in an air-tight box kills the mites, but many trials proved gassing of outdoor fields to be impracticable on a commercial scale. Gassing of runners, however, has already been adopted by growers. 10-12,000 plants at a time can be treated in a box of 1 m³; they are exposed to the gas for 6 hours at 20-25° C. The author recommends that infested strawberry fields should be turned in and a new plantation started with gassed runners.

1290. Massee, A. M. 634.11-2.752
A note on apple sucker [*Psyllia mali*].
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, p. 107.
The apple sucker still persists in parts of Kent where winter washing is not carried out as a matter of routine. Notes are given on its life history and appropriate control measures.

1291. Bramstedt, F. 634.11-2.753-1.521.6
Der Nachweis der Blutlausunanfälligkeit der Apfelsorten auf histologischer Grundlage. **(A histological method of determining the immunity of apple varieties to woolly aphis.)***
Z. PflKrankh., 1938, **48**: 480-8, bibl. 14.
Histological investigations carried out at the Biologische Reichsanstalt für Land- und Forstwirtschaft, Naumburg on Saale, on 1- and 2-year-old seedling apples showed that the woolly aphis produces characteristic changes in the attacked tissues not only of susceptible, gall-forming varieties but also in those of immune varieties and seedlings. The character of the change in each case shows clearly the degree of immunity or resistance of the plant under examination. A full description of the technique which was used by Börner and Gollmick in their experiments [*Angew. Bot.*, 1943, 25: 144-9; *H.A.*, 13: 797] is given in Bramstedt's paper.*

1292. Driggers, B. F., and Hansens, E. J. 632.752: 634.11+634.25
The Comstock mealybug on apples and peaches in New Jersey.
J. econ. Ent., 1943, **36**: 222-6, bibl. 3.
Incidence of heavy damage through the Comstock mealy bug, *Pseudococcus comstocki*, was reported from 2 apple orchards and 1 peach orchard in New Jersey. Occurrence of the pest was associated with old trees in vigorous vegetative growth after regular annual nitrogen applications. After liberation of *Allotropa* sp. and *Pseudaphycus* sp. as parasites in 1942 the damage was markedly reduced. It is uncertain to what extent climatic conditions unfavourable to the mealybug and a change in soil management practices have contributed to the improvement.

1293. Smith, C. F. 632.753: 634.11
The use of cyanide in controlling the root form of the woolly apple aphid.
J. econ. Ent., 1942, **35**: 908-10, bibl. 5.
Sodium cyanide was dissolved in water made alkaline by the addition of potassium hydroxide and applied to the soil at the base of 2-year-old apple trees. The alkalinity ensured that the hydrocyanic gas was not given off until the acid in the soil reacted with the alkali in the solution. Although in these experiments it was not necessary, as much as 5 grams of potassium hydroxide per tree can be used without affecting the controlling power of the cyanide. Injury occurred when more than 1 gram of sodium cyanide was applied to the soil per tree or when 1 gram was used in less than 1 quart of water. Carbon disulphide at the strongest solution used, 1-800 2 pints, was safe but gave poor control. The minimum strength of dichlorethyl ether, 1-800 2 pints, injured the rootlets. In practical work it is suggested that within the limits of safety the quantity of cyanide needed will depend on the moisture content of the soil and the degree of infestation, e.g. 0·5 gram of cyanide per tree in 1 pint of water gave good control in 1940. Enough liquid must be used to reach the lowest aphids which may be 10 inches below the ground. A list is given of some unsatisfactory materials tried.

1294. Duarte, A. J. 634.63-2.77
Um plano de luta contra a mosca da azeitona. **(A plan of attack against the olive fly.)**
Rev. agron., Lisbon, 1942, **30**: 380-94.
The need for an intensive study of the biology of the olive fly (*Dacus oleae*) in Portugal is urgent. The results of work done in other countries may not apply here in view of climatic and other differences. The author discusses some of the complicated problems involved and shows how they can best be approached and how the control of the insect is bound up in their solution.

1295. Ahlberg, O. 634.23-2.77
Körsbärsflugan* på reträtt. **(The cherry fly on the defensive.)**
Växtskyddsnotiser, 1943, Nr. 4, pp. 1-2.
In recent years the cherry fly had spread rapidly throughout Southern Sweden, being introduced from Central and Southern Europe with imports of White Heart cherries. Townspeople helped to spread the pest on their Sunday excursions by carelessly throwing bad cherries on the ground. This year, however, cherry orchards have been almost free from the pest, probably because the larvae were killed by the numerous sudden changes from frost to thaw and *vice versa* during last winter. Growers are urged to strip the trees before the cherries are fully ripe and to destroy all attacked fruits at once. This measure carried out rigorously may stamp out the pest completely. The author also advises the stripping of all *Lonicera tatarica* shrubs near cherry trees and the destruction of the berries.

1296. Parker, R. L., and Lamerson, P. G. 632.78
Lead arsenate and tricalcium arsenate combinations for the control of codling moth.
J. econ. Ent., 1943, **36**: 205-10, bibl. 1.
Several arsenic spray materials were tested in the experimental Jonathan orchards of the Kansas Agricultural Experiment Station, Manhattan, with the object of determining the effectiveness in the control of codling moth, the relative freedom from spray injury of the foliage and the effect of oil upon arsenic residue removal. Confirming results of previous experiments lead arsenate-zinc-sulphate-summer oil sprays (4 lb. lead arsenate, 1 qt. Superla summer oil emulsion, 4 oz. zinc sulphate per 100 gallons) gave the best moth control and caused least leaf burn; 80·8 to 86·3% clean fruit were obtained. The zinc sulphate reduced injuries from lead arsenate. Other sprays tested were: tricalcium arsenate-bentonite, lead arsenate bentonite and lead arsenate alone. An apparent disadvantage of the zinc sulphate addition was that the excellent foliage did not allow the fruit to colour so well as on trees which had suffered from defoliation owing to spray injuries. The application of hormone sprays, however, when the fruit started dropping resulted in the apples remaining on the trees and colouring there. Acid wash reduced the arsenical residue to 0·025 grains of arsenic per pound of fruit or less.

1297. Hansberry, R. 632.78
Toxicity of nicotine compounds to newly hatched codling moth larvae.
J. econ. Ent., 1942, **35**: 915-8, bibl. 4.
Laboratory tests of 31 compounds of nicotine were made against newly hatched codling larvae at Cornell University. Nicotine cuprocyanide proved to be the best material permitting only 8% entries in fruit sprayed with 0·5 lb. per 100 gal. and artificially weathered with 1 in. of rain. Fruit sprayed with 3 lb. lead arsenate per 100 gal. and similarly weathered sustained 44% entries. Some of the other compounds tested, especially those affected by weathering, might be improved by fine grinding, controlled precipitation or the use of supplements.

* Full translation available at Bureau.

* =*Spilographa cerasi* according to Auerbach *et al.*

1298. Janjua, N. A., Mustafa, A. M., and Samuel, C. K. 632.78
On the biology and control of codling moth (*Cydia pomonella* Linn) in Baluchistan.
Indian J. agric. Sci., 1943, **13**: 113-28, bibl. 17.
The biology of the codling moth and its control in Baluchistan is described in detail. Spraying with a mixture of 4 lb. lead arsenate and 1 qt. fish oil per 100 gallons, the most successful of the sprays tested, increased the marketable fruit from 20% to 84%.

1299. Steiner, L. F., Arnold, C. H., and Fahey, J. E. 632.78
Tests of Mississippi bentonites in tank-mix nicotine bentonite sprays for control of codling moth.
J. econ. Ent., 1943, **36**: 338-9, bibl. 4.
Mississippi bentonites were found to give equally good control of codling moth as Wyoming types in nicotine bentonite-soybean oil spray mixtures without leaving an objectionable residue characteristic for the latter.

1300. Dobroscky, I. D. 632.78
Orchard dusting experiments with natural cryolite for codling moth.
J. econ. Ent., 1943, **36**: 350-1, bibl. 2.
The effectiveness of dusting for codling moth as a labour saving substitute for spraying was tested on two widely separated blocks of McIntosh trees. The results were thought to be satisfactory, at least from a commercial point of view, as dusting was performed in as many hours as days were needed for spraying. After the delayed dormant and pre-pink sprays Kryocide and sulphur dust as well as lead arsenate and sulphur dust were applied during May, June and July. The average stings and entries in the Kryocide samples were 6·7% as against 14·6% in the lead arsenate samples. The control of apple scab was also very satisfactory in spite of a wet season.

1301. Harman, S. W. 632.78
Further studies on rotenone and other organic insecticides for codling moth control.
J. econ. Ent., 1943, **36**: 200-4, bibl. 1.
The relative efficiency of rotenone and other organic insecticides for codling moth control was studied at the Agricultural Experiment Station, Geneva, N.Y., in two McIntosh orchards during 1942. Previous tests with commercial extracts having been discouraging the finely powdered plant products were employed. Both nicotine and rotenone proved highly effective and superior to 6 other sprays tested when applied every week or ten days during the period of codling moth activity. Rotenone was applied in the form of ground derris root containing 5·7% of this substance (2·5 lb. derris, 1 qt. oil 875+spreader per 100 gallons). Nicotine was used as Black Leaf 155 and as nicotine sulphate; the first seemed to leave a more highly coloured finish on the fruit (1·5 lb. Black Leaf, 3 pt. oil 875+ spreader per 100 gallons). Pyrethrum sprays used both as the ground flowers and the extract were inferior to rotenone and nicotine. The insecticide was mixed into a paste with a small amount of water which already contained the spreader. The resulting paste was then poured into the water in the tank and the oil finally added. A spray prepared in this manner left no objectionable visible residue on the fruit. Several commercial spreaders tested were of equal value.

1302. Steiner, L. F., Arnold, C. H., and Fahey, J. E. 635.655: 632.951: 632.78
Soybean phosphatides as deposit-builders in nicotine bentonite and lead arsenate spray mixtures for control of codling moth.
J. econ. Ent., 1943, **36**: 70-1.
The authors' successful experiences with soybean phosphatides used for the purpose mentioned in the title is described. These experiments are to be regarded as preliminary and much yet remains to be discovered, especially in connexion with the chemical aspects of the problem, variation in performance when crude phosphatides from other sources are used, efficiency of application in relation to distance of nozzle from the fruit, effects on tree and on the various stages of the insect, the type of deposit and resistance to weathering.

1303. Smith, C. F. 634.25-2.78
Experiments with the peach tree borer in North Carolina.
J. econ. Ent., 1943, **36**: 215-8, bibl. 8.
Studying the control of the peach tree borer at the North Carolina Experiment Station, Raleigh, the author found ethylene dichloride emulsion to be more effective than paradichloro-benzene. Mounding of the trees after application of ethylene dichloride emulsion was an advantage, but a small mound, which need not be patted down in sandy soil, was just as efficient as a large one.

1304. Johansson, E. 634.725-2.78+2.726
Ett par aktuella skadedjur på bärbuskar. (**A couple of gooseberry pests.**)
Växtskyddsnotiser, 1943, Nr. 4, pp. 11-4.
The gooseberry moth, almost unknown a short while ago, has become a serious pest on gooseberries and currants in Sweden during the last few years. The moth's life history and control measures are described. The other pest briefly dealt with is the gooseberry sawfly on whose incidence in Sweden there are many reports.

1305. Pyenson, L. 634.11-2.793
A destructive apple sawfly new to North America.
J. econ. Ent., 1943, **36**: 218-21.
A European pest, the apple sawfly, *Hoplocampa testudinea* Klug., was found in America for the first time on Long Island, N.Y., in 1939. Observations indicate that the standard apple sprays do not seem to hold this new pest in check.

1306. Yeager, A. F., and Calahan, C. L. 632.576.5
Control of poison ivy (*Rhus toxicodendron*) by spraying.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 234-6, bibl. 1.
Ammonium sulphamate ¾ lb. to 1 gal. water applied during active growth successfully controlled poison ivy.

1307. Woodworth, C. E. 632.765
Tests using 1, 1-dichloro-1-nitroethane against wireworms.
J. econ. Ent., 1943, **36**: 335-6, bibl. 2.

1308. Jenny, J. 532.5+533.7
Strömung von Gasen und Flüssigkeiten in Kanälen, Leitungen, Räumen und die entstehenden Verteilungen und Verluste. Anwendungsgebiete in der Landwirtschaft. Erhöhung der Wirtschaftlichkeit. (**The flow of gases and liquids in conduits, pipes, etc., and their consequent distribution and losses. Increased usefulness in agriculture.** [French summary 1½ p.] Reprinted from *Landw. Jb. Schweiz*, 1942, **56**: 555-603.
The author shows how to improve the flow of liquids and gases through pipes, etc., by applying certain technical laws. Detailed consideration is given to the adjustment of the cross section of nozzle and pipe with respect to the pressure of the pump in order to combine maximum spraying performance with greatest economy in energy and wear of the engine. Further advice is given on the construction of storage cellars offering good ventilation and constant temperature.

1309. CUNNINGHAM, G. H. 632.95: 351.823.1
Certification of therapeutants.
Orchard. N.Z., 1943, Vol. **16**, No. 8, Suppl. pp. 2.
In order to enable New Zealand consumers to purchase only effective sprays, dusts, fumigants, etc., certification of therapeutants has now been introduced by the Plant Diseases Division, where producers' claims are officially tested.

1310. ZÄCH, C. 632.95
Die Durchführung der Pflanzenschutzmittelkontrolle in der deutschen Schweiz im Jahr 1942. **(Certification of proprietary plant protection substances in German Switzerland during the year 1942.)**
Schweiz. Z. Obst- u. Weinb., 1943, **52**: 346-9.
The testing of proprietary plant protection substances by State experiment stations was made compulsory in German Switzerland in 1942. Wädenswil dealing with 102 applications granted 61 either definite or provisory permits during 1942.

1311. HURST, H. 632.951
Principles of insecticidal bio-assay.
Nature, 1943, **152**: 400-4, bibl. 8.
An attempt is made to analyse some of the main factors which influence dosage-biological activity relations in systems in which insecticides are brought into contact with insects under controlled conditions.

1312. HORSFALL, J. G. 632.95
A conference on spray material shortage.
Chron. bot., 1943, **7**: 338-9.
A report is given on an informal conference held at Columbus, Ohio, in February 1943, to discuss the possibilities of stretching war short spray materials by reducing the dosage and increasing the efficiency of copper, rotenone, arsenical and mercury treatments. It was found that the standard spray concentrations could be reduced by one-half without affecting the results significantly, where the level of control exceeded 90%. Stretching the dosage by reducing the number of gallons per acre does not seem so effective as reducing the concentration of a spray.

1313. WEBER, A. L. 632.95
Spray coverage of apple trees as affected by different methods of applications.
Ill. Hort., 1943, **32**: 2: 6-7.
Spray coverage of apple trees obtained by different methods of application was measured at New Jersey Agricultural Experiment Station, New Brunswick. The so-called speed sprayer with 103 nozzles at the head end, a pump pressure of 40-50 lb. and an airplane-type propeller producing an air current, which forces the spray material into the tree, was superior to all other models tested. The mist deposited by this sprayer achieves a better coverage than the somewhat coarser particles forthcoming from spray guns and brooms, since a much smaller proportion of the liquid runs off the tree. In addition to economizing in spray material the speed sprayer saves considerable time and labour as compared with the more conventional type.

1314. MARTIN, H. 632.952
The evaluation of fungicides: a study in quantitative toxicology.
J. Soc. chem. Ind., Lond., 1943, **62**: 67-71, bibl. 26.
Though its practical performance is the crucial test of a fungicide, the difficulties attending the full "field" trial have prompted the analytical examination of fungicidal efficiency. The separate investigation of the factors determining efficiency is discussed; for some, such as distribution, tenacity, and stability, physico-chemical methods are possible; for others, such as the assessment of fungicidal value, methods of bio-assay are required. The use of statistical methods in the interpretation of the bio-assay has thrown light not only on fungicidal value but also on the mode of action and the chemistry of the fungicide. Examples are given from the copper and sulphur derivatives and from the dithiocarbamates. The summation of the results of the bio-assay and the physico-chemical methods permits a reliable prediction of the performance of the fungicide under practical conditions. [Author's abstract.]

1315. WILSON, E. E. 632.952
Physical characteristics of bordeaux mixture in relation to its qualities.
Phytopathology, 1943, **33**: 497-505, bibl. 12.
Bordeaux precipitate made by mixing diluted compounds was settled more slowly and was more bulky than that made by mixing concentrated components (12%) and then diluting. The physical reasons for this are explained. In weathering tests during winter, when rainfall totalled 3 to 4 inches, bordeaux prepared with diluted components lost only 18%, 34% and 38% of the copper, whereas prepared with concentrated components it lost 65%, 70% and 58%. The suspension quality of the concentrated type was improved by much agitation. That agitation also improved weathering quality was suggested but not proved statistically. In 2 of 3 tests the diluted constituent mixture deposited more copper, though that deposited by the concentrated constituent mixture was more visible on the twigs because coarser in texture.

1316. HICKMAN, C. J., MARSH, R. W., AND WILKINSON, E. H. 632.952
Preliminary experiments on the use of oil-soluble copper compounds as fungicides.
Ann. appl. Biol., 1943, **30**: 179-83.
Tests were made of the solubility of a number of copper compounds in mineral and vegetable oils. Phytocidal tests on onion foliage showed that turpentine, pine oil and white spirit were damaging whereas cottonseed oil and white oil were innocuous. Copper salts in white oil, white spirit, turpentine or pine oil showed a higher fungicidal value than in cottonseed oil. In laboratory tests, a solution of copper 3: 5-di-*iso*propyl salicylate was more fungicidal than bordeaux mixture of the same copper concentration. In a small field trial, copper 3; 5-di-*iso*propyl salicylate dissolved in white oil to give a concentration of 0·01% Cu was atomized three times at monthly intervals on to onion foliage without damage. The same material at 0·1% Cu in white oil was phytocidal. No control of onion mildew (*Peronospora schleideniana*) was obtained in this trial. The method of atomization was convenient and practicable for small-scale operation. It gave perfect wetting of the foliage and was very economical of material. [Authors' summary.]

1317. DIMOND, A. E., HEUBERGER, J. W., AND HORSFALL, J. G. 632.952: 633.491
Copper spray substitutes.
Amer. Potato J., 1943, **20**: 141-53, bibl. 36.
Tetrachlorquinone (Spergon), tetramethylthiuram disulfide (Thiosan and Dubay 1205FF), and dimethyldithiocarbamate (Fermate, Dubay 870, and IN-870), tested as copper spray substitutes at Lincoln, Nebr., and New Haven, Conn., have shown excellent disease control on a number of crops. Methods of overcoming such shortcomings of copper substitutes as high cost, limited production, high specificity, and low tenacity are discussed.

1318. HAMILTON, J. M., AND PALMITER, D. H. 632.952
Fermate—a promising new fungicide. May have a place in spray program for apples and stone fruits.
Farm Research, April 1943, from abstract *Wis. Hort.*, 1943, **33**: 261.
Fermate, chemically known as ferric dimethyl-dithiocarbamate, was found to control apple scab and cherry leafspot on Montmorency at the rate of 1½ lb. to 100 gallons. The addition of an equal amount of spray lime is suggested if the disease becomes established. A good spreader is necessary. The fungicidal action of Fermate is stronger than that of wettable sulphur, but its application has to

precede the infection period. Spraying with Fermate is expensive since it is a synthetic material not yet produced on a commercial basis.

1319. COOMBER, H. E., MARTIN, J. T., AND HARPER, S. H. 632.951
The determination of rotenone in derris root. A reply.
J. Soc. chem. Ind., Lond., 1943, **62**: 73-5, bibl. 5.

The criticism by Edwards* of the method established by the authors† for determining rotenone is answered. The position with regard to sampling derris consignments is discussed, and the need for the improvement of sampling is shown. Objections to the method of analysis given by Edwards* are stated. [Authors' summary.]

1320. GUNTHER, F. A., AND TURRELL, F. M. 632.951
A preliminary report of a critical examination of the roots of *Derris elliptica*.
J. econ. Ent., 1942, **35**: 941, bibl. 4.

Rotenone in fresh and dried derris root examined at Riverside Citrus Experiment Station, California, was present as discrete globules of rotenone-containing resin in parenchyma cells in pith, medullary rays, and irregularly dispersed groups of cells in cortex and bark but not in the bark cork or the vessels and fibres of wood or bast or in any cells containing starch. The outer layer of fresh bark contains numerous non-water-soluble tannin bodies. Aqueous extracts of root contain levulose, glucose, saccharose and xylose. The nature of the resin bodies is discussed. The root contains large quantities of hemolysing saponins and its effectiveness as a fish poison may be in part due to such accompanying substances. More work is needed on the saponin materials present in derris.

1321. GUNTHER, F. A. 632.951: 612.014.44
Effects of oxygen and sunlight on decomposition of rotenone in spray mixtures.
J. econ. Ent., 1943, **36**: 273-81, bibl. 29.

Rotenone and derris-containing preparations in spray mixtures were found at the University of California Citrus Experiment Station to decompose very rapidly under the influence of oxygen and sunlight. Spray mixtures containing these ingredients should, therefore, be protected against the action of oxygen, sunlight and high temperature.

1322. ARANT, F. S. 632.951
Relative effectiveness of several rotenone-containing insecticides against various insects.
J. econ. Ent., 1942, **35**: 873-8, bibl. 16.

Commercial samples of derris, timbo, cubé and *Tephrosia* roots were tested in the field and laboratory for insecticidal efficiency against various classes of insects. The data indicate the inadequacy of the rotenone content alone to express the insecticidal value of a rotenone bearing product and emphasize the importance of the Goodhue rotenone-deguelin value as a supplementary expression. [From author's summary.]

1323. TUNBLAD, B. 632.951.8
Nyare rön om karbolineumpreparat. **(Recent experiments with spring carbolineum sprays.)**
Växtskyddsnotiser, 1943, Nr. 1, pp. 11-3.

A new type of carbolineum spray, the so-called spring carbolineum, which contains less oil and a different type of emulsifier, is described and results of experiments with this spray in several countries are discussed. Spring carbolineum has not been used in Sweden to any extent, but the author expresses himself against its application there. Among the reasons given are the following two:—(1) that an addition of 2·5% sodium lye, which was found necessary in Vienna experiments, would precipitate the oil of Swedish carbolineum; (2) that if copper lime is added spring carbolineum has to be applied at the very last moment, whereas Swiss investigations into the best timing of carbolineum sprays against woolly aphis have shown that spraying should be done one month before hatching.

1324. ROSS, W. A., AND ARMSTRONG, T. 634.13: 632.951.8
An experiment with high concentrations of lubricating oil sprays.
Sci. Agric., 1943, **23**: 692-3.

Fifteen consecutive annual applications of a 10% lubricating oil spray (viscosity 170-220), applied in March or April when the buds were dormant, caused no commercial damage to pear trees, and the same number of applications of a 20% concentration produced no fatal or permanent injury. [Authors' summary.]

1325. CHAPMAN, P. J., PEARCE, G. W., AND AVENS, A. W. 632.78: 632.951
Relation of composition to the efficiency of foliage or summer type petroleum fractions.
J. econ. Ent., 1943, **36**: 241-7, bibl. 9.

A number of petroleum fractions of the so-called summer-type spray oils were tested to determine their efficiency in killing eggs of the oriental fruit moth, the codling moth and the eye-spotted bud moth. Efficiency was found related to the chemical composition of the oils. Thus, the oil most predominantly paraffinic in character was found ten times more efficient than some of the so-called naphthenic type. Contrary to common belief, highly refined or white oils were more efficient than the corresponding less refined products. In other words, efficiency was increased with the removal of the aromatic constituents. The three species of insects studied showed no significant difference in the response to the oils tested. [Authors' summary.]

1326. EKSTRAND, H. 632.95
Spridningsmedel för besprutningsvätskor. **(Spreaders for spray mixtures.)**
Växtskyddsnotiser, 1943, Nr. 2, pp. 3–4,

In experiments at the Statens Växtskyddsanstalt, Stockholm, the coverage of several spray mixtures was determined with and without spreaders. Denoting complete coverage as 5, values of 4·5 were obtained with all spray mixtures if the spreaders T.A. or T.B. were added at concentrations of 0·1 and 1% respectively. The effect of an addition of 10% skimmed milk varied from 2 to 2·5.

1327. HARTZELL, A. 632.951
Pyrethrum culture in Dalmatia with some applications to the Americas.
J. econ. Ent., 1943, **36**: 320-5, bibl. 12.

The cultivation of pyrethrum (*Chrysanthemum cinerariaefolium*) in Dalmatia is described in detail. The author, of the Boyce Thompson Institute for Plant Research, points out regions in the Americas where this source of pyrethrin could be grown successfully now that the invention of a suitable harvester has made economic cultivation possible.

1328. HANSBERRY, R., AND LEE, C. 632.951
The yam bean, *Pachyrrhizus erosus* Urban, as a possible insecticide.
J. econ. Ent., 1943, **36**: 351-2.

Preliminary experiments on the toxicity of yam bean seed extracts at the Cornell University, Ithaca, N.Y., indicate the insecticidal value of this plant which is already being extensively used in China. It is believed that the toxic effect of yam bean is not due to rotenone.

1329. CASSIL, C. C., WADLEY, F. M., AND DEAN, F. P. 634.11-2.95
Sampling studies on orchard spray residues in the Pacific North West.
J. econ. Ent., 1943, **36**: 227-31, bibl. 5.

PARKER-RHODES, A. F. 632.952
Studies in the mechanism of fungicidal action. V. Non-metallic and sodium dithiocarbamic acid derivatives.
Ann. appl. Biol., 1943, **30**: 170-9, bibl. 17.

* *J. Soc. chem. Ind., Lond.*, 1942, 61: 192-4; *H.A.*, 13 : 448.
† *J. Soc. chem. Ind., Lond.*, 1942, 61: 110-2, *H.A.*, 13: 447.

VEGETABLES, RUBBER AND OTHER PLANTS.

1330. (SECRETT, F. A.) 635.1/7
Planned production.
Market Gr., 1943, **21**: 14: 4-6, **21**: 15: 1-7.
An account of a visit to the Walton and Milton vegetable farms of Mr. F. A. Secrett. There is much useful information on the successful methods used with the various crops. Close attention is paid to preparation of the land, to rotation, timing, the selection of the most suitable varieties and attractive packing.

1331. BURNS, W. 635.1/7: 631.531
Vegetable seed production in India.
Ind. Fmg, 1943, **4**: 69-71.
The interruption of vegetable seed supply to India has made the production of home-grown seeds, especially of cabbage, lettuce, turnip, carrot, and beetroot seed imperative. The Valley of Kashmir and areas of about 5,000 ft. elevation in the Himalayan foothills are said to be suitable for vegetable seed production. Notes are given which should help the would-be seed producer of the above vegetables and of onions, tomato and brinjals.

1332. MACGILLIVRAY, J. H., HANNA, G. C., AND MINGES, P. A. 635.1/7: 631.55: 581.192
Vitamin, protein, calcium, iron and calorie yield of vegetables per acre and per acre man-hour.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 293-7, bibl. 4.
The rating of crops based on yield per acre of food constituent and on yield per acre man-hour showed (in California) that spinach, carrots, potatoes, winter squash, cabbage and cauliflower can be rated as high efficiency crops in both categories. The investigations were undertaken to discover what crops should be retained and what eliminated in order to assure the nation of an adequate wartime vegetable diet in the face of a decreasing supply of agricultural labour.

1333. SCHUPHAN, W., AND WELTZ, J. 635.1/7: 613.2
Biologischer Wert und Hektarertrag von Freiland- und Gewächshauserzeugnissen insbesondere von Gemüse. **(The biological value and yield per hectare of field and greenhouse produce, especially vegetables.)**
Landw. Jb., 1943, **92**: 431-86, bibl. 22.
The term biological value covers the total amount of biochemical substances representing the health and food value of a plant, such as sugar, protein and organic acids, as well as the non-caloric vitamin C and provitamin A. Since earlier analyses proved inaccurate, partly because of the methods employed, partly because of the introduction of so many new varieties, the authors undertook to analyse 66 vegetables during 7 years at the Institut für Gemüsebau, Grossbehren. The vast majority of the vegetables were grown in the open under a variety of controlled conditions. The methods of analysis and calculation are described. 32 tables and 15 figures present such data as were obtained for percentages of dry substance, of pure protein content (pure protein = N × 6·5) and of sugar, carotene and ascorbic acid content, content of volatile oils and of mineral substances and yield per hectare of all the substances mentioned. It is urged that yield in valuable substances per hectare should be more generally adopted as a basis of crop valuation. In that case the advantage of growing still more vegetables in proportion to other crops would be readily recognized. Whereas vegetables contain only 1·1% protein on the average as compared with 9·4% in cereals the protein yield of some vegetables per hectare is far superior to that of cereals. The otherwise almost unknown garden orache leads with 875 kg./ha., white cabbage and green kale follow with 860 kg. and 467 kg. as compared with maize 301 kg. and winter wheat 244 kg. 1 ha. of red cabbage contains 38 kg. ascorbic acid, 10 times the amount of strawberries and 20 times that of lettuce. Onions have the highest sugar content with more than 3,000 kg./ha. followed closely by forced cucumbers as compared with parsnips 1,800 kg. and peas (yellow) 100 kg. The highest content of dry substance is attained by horse radish with more than 1,100 kg./ha. as compared with late carrots, potatoes, mangolds 5,000 kg. and wheat 2,000 kg.

1334. RAHN, E. M. 635.1/7: 631.8
Getting the most from fertilizers for vegetable crops.
Bull. Pa agric. Exp. Stat. **433**, 1943, pp. 13.
In experimental work during 5 seasons starter solutions of 8 lb. of 4-16-4 fertilizer per 50 gal. water for tomatoes, cabbage, sweet corn and snap beans and 4 lb. of the same fertilizer for seeded crops were found to increase the yield significantly. A cupfull of the solution was applied to the roots of each transplant as it stood in the hole before the soil was pulled in over them. About one quart was applied to each 10 feet of seeded row before covering the seed with soil. This treatment proved particularly beneficial in increasing early yields of the crops mentioned, other vegetables having not yet been tested. The fertilizer should be mixed with water at least one hour before using, stirred from time to time and finally diluted to the volume required. Other combinations of complete fertilizer may be substituted for the 4-16-4 one. In large-scale field experiments the effects of applying fertilizers broadcast, in bands, in broken bands, ploughed down broadcast, ploughed down in bands and applied as solution were compared. As far as vegetables are concerned the ploughing down of a single band of fertilizers in each furrow gave particularly promising results. The advantage of this method is thought to be that the fertilizer located 6-7 in. below the surface is surrounded by moist soil and can go into solution and enter the roots more freely. Furthermore, the nutrients are less readily immobilized or leached. Application of the fertilizer in a single band has the additional advantage that the nutrients become slowly available throughout the season. All the crops tested: tomatoes, sweet corn, peas and carrots, responded favourably to the treatment. The results obtained by applying fertilizer in solution did not warrant the introduction of this method for vegetable cultivation. The combination of a starter solution and band placement is recommended for seeded crops.

1335. KUDZJAVCEVA, A. A. 635.1/7: 631.83
The effect of potassic fertilizers on vegetable yield and quality. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 3, pp. 72-85.
The effects of adding potash to the nitrogenous and phosphatic fertilizers applied to vegetables at different stages of growth and on different soils were studied by the Vegetable Institute. It was found possible to classify vegetables in descending order of potassium requirements as follows:—beetroot, onions, cucumbers, cabbage, carrots, tomatoes. Beetroot and cabbage could stand large doses (120-180 kg. per ha.). Heavy potassic manuring depressed the yields of cucumber, onions and carrots. Irrigation or regular watering enhanced the effect of large doses. Mixing NaCl with the muriate resulted in increased sugar content and dry matter in beetroot and gave a fruity taste to tomatoes. There were indications that NaCl could partially replace KCl without loss of yield or quality. The use of KCl tends to increase the ash fraction in plants, and to decrease the Ca content and the dry matter. Where precipitation is plentiful and the soil is of low water-holding capacity the prolonged use of muriate reduces the Ca content of the soil and necessitates regular liming.

1336. SAMOJLOVA, A. 635.1/7: 631.85
The effect of phosphorite meal on the yield of vegetables. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 3, pp. 86-97.
Several years' experiments on the effects of soluble and insoluble phosphorus salts given as fertilizers to vegetables led the author to the following conclusions:—Phosphorite meal was particularly suitable for cabbage, marrows, beans, celery, cauliflowers and beetroot, had little effect on onions and carrots and was definitely unsuitable for tomatoes. Chlorinating the meal before application resulted in increased yield of beetroot and decreased yield of onion. Combined with organic compost on a heavy clay soil it had no effect the first year but good results in the second on cabbages and cucumbers. Phosphorite for maximum effects should be given in the autumn in amounts double those used for soluble P compounds and should be associated with ammoniacal nitrogenous fertilizer and potash. Its effect is lasting.

1337. PEROLD, I. S. 635.1/7: 631.8
Fertilizing vegetables in the winter-rainfall area.
Fmg S. Afr., 1943, **18**: 195-6, 200, bibl. 1.
Farmers in South Africa who have recently taken to vegetable growing are getting less productive results than they might because the wrong type of fertilizer is used. Fertilizer mixtures in South Africa are now standardized, each being assigned a letter of the alphabet for identification. The composition of the different mixtures being somewhat of a mystery to farmers, instructions are here given as to which they should use for a given crop, always, it is emphasized, in conjunction with stable manure, karroo manure or compost. The nature of these 3 materials is described. The use of karroo manure requires some circumspection on account of its high alkaline content.

1338. FLEMING, W. E., BAKER, F. E., AND KOBLITSKY, L. 632.951.23: 635.1/7
Effect of lead arsenate in soil on vegetables.
J. econ. Ent., 1943, **36**: 231-3.
Tests on the effect of lead arsenate in the soil upon vegetables were carried out both in the greenhouse and in the field at Moorestown, N.J., in 1933 and 1934 as a preliminary study of the control of the Japanese beetle, *Popillia japonica* Newm. The germination of beets, muskmelon and spinach was reduced by 13-22% in a soil containing 2,000 lb. lead arsenate per acre, whilst 28 other vegetables were not affected. The germination of string beans and lima beans was most severely affected by lead arsenate. Seedling growth was found to be retarded, but in soils containing not more than 2,000 lb. lead arsenate in a top layer of 3 in. plant growth became normal when the roots had penetrated beyond that layer. Larger quantities of lead arsenate impaired the yield of vegetables with the exception of beets, eggplants, peppers, sweet potatoes, potatoes and tomatoes. Even when 4,000 lb. of lead arsenate were applied to the acre most vegetables contained less than 0·005 grain of arsenic per lb. of fresh weight, though lettuce, radishes and onions contained 0·015, 0·029 and 0·060 grains respectively.

1339. (BEWLEY, W. F.) 631.544
Experimental results in 1942 [at Cheshunt].
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 17-26.
The following are taken from the survey of results at Cheshunt in 1942:—Three years' trials indicate that so far as the Station's soils are concerned and for all practical purposes the differences resulting to the tomato crop from the use of muriate as against sulphate of potash are negligible. Results of variety trials are recorded both of glasshouse varieties at Cheshunt and outdoor varieties in the counties. Trials in 7 counties of single *versus* double row planting show that in 6 counties the total yield per acre was significantly increased by planting in double rows, i.e. 18 inches between plants in the row and 18 inches between the double row, with a 3-foot path between them and the next row, the spacing of plants in the single rows being also at 18 inches with a 3-foot path between rows. The continued success of Cheshunt Early Giant lettuce for marketing between December and March and of Cheshunt Early Ball as a frame lettuce is noted. Seed is available of certain crosses. The availability of a small amount of Scarlet frame carrot seed is also noted. This variety is suitable for glasshouse growth; it produces a very small top with a bright red root of high quality.

1340. OWEN, O. 631.544: 631.8
Chemical problems [in glasshouse work].
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 62-9, bibl. 3.
Brief notes are given of analyses of fertilizer products submitted for examination. Trials showed that Cheshunt soils apparently contain sufficient molybdenum for successful lettuce growing. Tests of plant ash suggest that a dressing of about 1 lb. per square yard is about the maximum top dressing of ash that a tomato plant will tolerate. Tabulation of crop yields and soil reaction in a block of houses which had been in cultivation with tomatoes for 20 years and had for many years had winter lettuce showed excellent crops and pH's varying from 7·69 to 7·93. Pot experiments indicate that potash applied to pots has a more potent effect than a similar amount applied to borders and that more care is necessary when using the muriate than the sulphate. Preliminary results of minor element nutritional trials are reported and symptoms are noted of manganese-, boron- and magnesium-deficiencies in tomatoes.

1341. PORTER, A. M., AND ODLAND, M. L. 631.544: 631.588.1
The influence of methods of heating and covering electric hotbeds on field production of vegetables.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 251-4, bibl. 9.
In a comparison of methods of artificial heating and covering, the following installations were tested:—(1) eight 25-watt inside-frosted A-19 bulb Mazda B lamps were used to heat each 3×6 feet sash on the hotbeds. The lamps were mounted in inexpensive porcelain sockets on 8½ inch centres to the under side of a 6-foot removable wooden strip which spanned the bed just beneath the centre of the sash. (2) Two 60-foot cables, 400 watts each, were installed in each of the 4-sash cable heated hotbeds, the cable being laid near the surface of soil and covered with a wire screen. The circuits in each case were thermostat controlled at 50° and 60° F. and had a check watt-hour meter. Two types of frame covering were used, glass and cellulose acetate film. The crops were planted in plots under each of these treatments and replicated at random in the beds, with randomized controls in the field. *Quality*. Warm season crops—tomatoes, egg-plants and peppers showed no difference. For cold season crops lettuce did better under film; bulbs were better than cable for cauliflower. *Yield*. The yield of warm season crops was significantly better from the cable-heated bed but not enough to justify the extra cost as compared with bulb heat. In the cool season crops there was no significant difference between heating treatments. The general conclusion was drawn that incandescent lamps for heat and cellulose acetate film for sash covering are worthy of consideration for hotbeds where early plants are to be grown for field planting.

1342. SPEYER, E. R. 632.651.3
Eelworms (*Nematoda*).
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 48-50.
The effects of introducing potassium iodide and other chemicals into the soil solution when growing tomatoes are being tested.

1343. LINDFORS, T. 632.944: 631.544
Använd cyanväte till insektsbekämpning i växthus. (Control of insect pests by HCN in the greenhouse.)
Växtskyddsnotiser, 1942, Nr. 2, pp. 27-8.
The ban on fumigating greenhouses with hydrogen cyanide has been lifted in Sweden, but its use is restricted to trained experts holding a certificate of the Plant Protection Station, Stockholm. 88 such certificates have been issued so far. Growers still seem to prefer nicotine; it is urged, however, that nicotine stocks should be saved for outdoor application. Trials and practical experience show that in general HCN controls insect pests very satisfactorily and that only in its control of spiders and mites is it somewhat inferior to nicotine.

1344. EIDE, P. M. 632.73: 631.544
Host plants of the banded greenhouse thrips.
J. econ. Ent., 1943, **36**: 327-8.
The degree of infestation by *Hercinothrips femoralis* of 51 greenhouse plants is indicated in a table.

1345. SPEYER, E. R. 631.544: 632.654.2
Red spider mite (*Tetranychus telarius*).
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 50-3.
Results of trials at Cheshunt do not warrant the use of tartar emetic with glycerine or with molasses as a means of mite control in glasshouses in this country. There are indications from trials and observations that autumn fumigation of tomato houses with naphthalene or sulphur dioxide is unlikely to be of much value.

1346. SPEYER, E. R., AND PARR, W. J. 632.76: 635.52
Wireworm investigations.*
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 54-9.
Trials at Cheshunt indicate that under the conditions obtaining, wireworms moved more rapidly in looser than in more consolidated soil, that they preferred the warmer parts of the soil, that germinating wheat plants afforded much protection to lettuce plants and that replacements of lettuce previously destroyed protected established plants in their vicinity to a certain extent.

1347. DUSTAN, G. G. 632.78: 631.544
The effect of tartar emetic on the greenhouse leaf-tyer, *Phlyctaenia rubigalis* Gn.
Sci. Agric., 1943, **23**: 527-36.
Tartar emetic sprays were shown in laboratory tests at Vineland Experiment Station, Ontario, to cause high mortality, especially among the first two instars, of greenhouse leaf-tyer larvae. Kill was improved by the addition of brown sugar (tartar emetic 2 lb. or 4 lb., brown sugar 4 lb., water 80 gal.) and depressed by the addition of spreaders. There was no significant difference in results between the two concentrations of tartar emetic tried. When adult moths were added to the cages the number of eggs laid in the treated cages was much less than in the check cages. There is also some evidence that tartar emetic kills a proportion of the eggs. Dusts containing 5% to 10% tartar emetic were effective against larvae. Under conditions approximating those of a commercial greenhouse, however, only partial control was obtained by two applications of tartar emetic.

1348. TURNER, N. 632.951
The effect of diluents on the toxicity of pure ground derris root in dusts.
J. econ. Ent., 1943, **36**: 266-72, bibl. 18.
The effect of pyrophyllite, flaky talc, fibrous talc and clay as diluents of pure ground derris root upon the toxicity to *Aphis rumicis*, striped cucumber beetle, potato flea beetle, Mexican bean beetle and cabbage worms was studied at the Connecticut Agricultural Experiment Station. In laboratory tests 0·25% rotenone with pyrophyllite was more toxic than 2% rotenone with fibrous talc or clay. In the field 1 part of derris diluted with pyrophyllite proved as effective as 2·5 to 5 parts of derris mixed with clay.

* See also 1307.

1349. HOWARD, N. F., AND APPLE, J. W. 632.951: 632.753
Toxicity of cubé-vegetable oil dusts to two species of aphids.
J. econ. Ent., 1943, **36**: 59-62, bibl. 8.
In laboratory experiments in U.S.A. cubé-talc dust (0·25% rotenone) proved significantly more toxic to *Aphis gossypii* on okra leaf when combined with 1% grapefruit seed oil or soybean oil than when used alone, and more toxic but not significantly so with the addition of 1% peanut or olive oil. *Myzus persicae* on turnip seemed somewhat more resistant to the dusts than *Aphis gossypii*. Two nicotine dusts prepared, to aid the evaluation of cubé, from 40% nicotine sulphate and hydrated lime and containing about one-third the strength of nicotine used in the field produced immediate knockdown but in 2 days the aphids had recovered. Conclusions as to the relative efficacy of nicotine dust at one-third the strength recommended for field use as compared with cubé dust at similar dilutions may not be valid for stronger mixtures.

1350. WALKER, H. G., AND ANDERSON, L. D. 632.753 +632.78
Control of aphids and diamond-back moth larvae on collards with rotenone-nicotine dusts.
J. econ. Ent., 1943, **36**: 343-7, bibl. 3.
The relative effectiveness of several nicotine, derris, derris-nicotine and derris-pyrethrum dusts for the control of cabbage aphids, *Brevicoryne brassicae*, green peach or spinach aphids, *Myzus persicae*, and larvae of the diamond-back moth, *Plutella maculipennis* was studied at the Virginia Truck Experiment Station, Norfolk.

1351. DONOHOE, H. C. 632.76: 632.944
Development of new methyl bromide fumigation schedules for use against Japanese beetles.
J. econ. Ent., 1943, **36**: 260-2, bibl. 2.
Five fumigation schedules aimed at freeing fresh produce from Japanese beetles in various types of trucks were found practicable in experiments carried out at the U.S.D.A. Bureau of Entomology and Plant Quarantine.

1352. LANGFORD, G. S., MUMA, M. H., AND CORY, E. N. 632.76
Attractiveness of certain plant constituents to the Japanese beetle.
J. econ. Ent., 1943, **36**: 248-52, bibl. 11.
Of 52 materials, most of them of plant origin, tested for attractiveness to the Japanese beetle at the University of Maryland, College Park, at least 30 had attractive qualities. Geraniol and eugenol had the highest attractive value followed by citronellol, phenyl ethyl alcohol and linaloe. On the whole mixtures were more attractive than any of the constituents separately. The object of the investigations was to improve bait formulas and to find substitutes for materials not at present available.

1353. BULGAKOVA, Z. P. 633.491: 581.142.036
Study of the dormancy period in potatoes as related to changes in temperature. [Russian.]
Sovetsk. Botanika, 1941, No. 1-2, pp. 181-4.
Reference to the literature shows that Müller Thurgau, Hopkins and Rosa have succeeded in breaking the dormancy by low temperature treatment (in the region of 0° C.), Rosa and Newton by high temperature (30-35° C.) and Snell by alternating hot and cold (8 days 30-32° C., 8 days 1-2° and 8 days 30-32° C.). In the present experiments tubers of Rosafolia were harvested on 13th September, 1939, and immediately subjected to various temperatures. Those

kept at 30-32° C. sprouted after 2-7 days, those at 2-6° C. after 29 days and those at 12-16° C. after 33 days. When the tubers had been kept for 42 days before treatment was applied, a period of 2-8 days of treatment sufficed to induce sprouting, and after 45-50 days no treatment was required.

1354. Bates, G. H. 633.491
Propagation of potato seed tubers from stems.
Nature, 1943, **152**: 135.
It was found at the Farm Institute, Penkridge, that aerial stem pieces of early potato cut to 3-node length and deprived of leaves but not of small axillary shoots will, if buried 2 to 3 inches deep in moist soil, give rise to small plants and a crop of seed-size tubers before winter. The application of a slug deterrent is advised. It has also been found that similar stem pieces if laid in damp sand or moss and kept dark as in cellar or boxes will produce tubers in the axils in about 10 days. Tubers so produced should have reached planting size by the autumn. The experiments are continuing.

1355. Foister, C. E. 633.491-2.4
On the control of potato skin spot disease.
Ann. appl. Biol., 1943, **30**: 186-7, bibl. 2.
The potato tuber disease known as skin spot (*Oospora pustulans*) is important for its disfigurement of ware potatoes of some varieties to an extent affecting their potential sale and for causing blindness in planting potatoes. Excellent control of the disease was obtained at East Craigs, Scotland, by dipping the potatoes in either of two organo-mercurial compounds in October before clamping. When planted in April the dipped seed tubers had a quicker and stronger emergence than the undipped and their final percentage emergence showed an advantage of about 12%. In final yields the undipped control showed a loss of crop of approximately 11·8%. These results prove that Greeve's and Muskett's* recommendations apply equally to Scottish conditions and to varieties other than those used by them.

1356. Montgomery, H. B. S., and Shaw, H. 633.491-2.411
Field trials of phenyl mercury chloride for the control of potato blight.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 68-70.
Results in 1942 and 1943 of the use of phenyl mercury chloride in concentrations up to 0·0025% were not encouraging.

1357. Sheffield, F. M. L. 633.491-2.8
Value of phloem necrosis in the diagnosis of potato leaf-roll.
Ann. appl. Biol., 1943, **30**: 131-5, bibl. 14.
In potato plants infected with leaf-roll virus diagnosis is often difficult, for the symptoms vary and rolling can result from other causes. It is shown that in leaf-roll virus a type of phloem obliteration and necrosis occurs which is distinct from any other abnormality whatever the cause. The necrosis occurs in the primary phloem only of the bicollateral bundles. Sections of the affected tissues, which are taken through a node, are put for 1 minute into a 50% alcohol solution of 1% phloroglucinol, after which the alcohol is replaced for a minute by 50% HCl. The HCl is drained off and the sections mounted in water are examined under the microscope at about ×100.

1358. Ware, L. M., Brown, O., and Yates, H. 633.491-1.85
Residual effects of phosphorus† on Irish potatoes in South Alabama.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 265-9, bibl. 5.

* *Ann. appl. Biol.*, 1939, 26: 481-96.
† See also abstract 1135.

Bald, J. G., and Norris, D. O. 633.491-2.8
Transmission of potato virus diseases. 1. Field experiment with leaf roll at Canberra, 1940-41, pp. 14, bibl. 4. **2. The aphis population of potatoes at Canberra during 1940-41,** pp. 13, bibl. 12.
Bull. Coun. sci. industr. Res., Aust., **163**, 1943.

Bald, J. G., and White, N. H. 633.491-2.8
Potato virus X: The average severity of strain mixtures in three varieties of potato.
Reprint from *J. Coun. sci. industr. Res., Aust.*, 1942, **15**: 300-6, bibl. 5.

Ossiannilsson, F. 633.491-2.754-2.8
Studier över de svenska potatisfältens insektfauna och dess betydelse för spridning av virussjukdomar. I. *Hemiptera*, förekomst och utbredning. **(Studies on the insect fauna of Swedish potato fields and its effect on the spread of virus diseases. I. *Hemiptera*, their occurrence and distribution.)** [German summary 1 p.]
Medd. Växtskyddsanst. Stockh. **39**, 1943, pp. 72, bibl. 53.

Boyd, A. E. W. 633.491-2.654.1
Stimulation of larval emergence in *Heterodera schachtii* Schmidt, by certain concentrations of silver compounds.
Ann. appl. Biol., 1943, **30**: 161-3, bibl. 7.

Boyd, A. E. W. 633.491-2.654.1
Observations on the biology of the potato-root eelworm, *Heterodera schachtii* Schmidt.
Ann. appl. Biol., 1943, **30**: 157-61, bibl. 10.

Miles, H. W., Henderson, V. E., and Miles, M. 633.491-2.654.1
Field studies of potato-root eelworm, *Heterodera rostochiensis* Wollenweber, 1938-40.
Ann. appl. Biol., 1943, **30**: 151-7, bibl. 13.

1359. Milthorpe, F. L. 633.52
The growth and fibre production of flax.
J. Aust. Inst. agric. Sci., 1943, **9**: 72-6.
Experiments carried out at Leeton and Berwick showed that flax fibre changes at maturity from the weft to the warp class and that the crop requires large amounts of phosphorus and nitrogen but little potash.

1360. Lewis, A. H. 633.52-1.8
The uptake of nutrients by flax.
J. agric. Sci., 1943, **33**: 169-73, bibl. 5.
No relation was found between percentages of any one nutrient in the Norfolk and N. Ireland flax samples examined and yield data, percentage fibre in crop or grade of fibre. The common belief that potash fertilizers are of overriding importance for flax were not supported by the results. The importance is stressed of a clean seed bed, even depth of sowing and steady unchecked growth.

1361. Cottier, K. 633.52-2.13
Hail damage in linen flax.
N. Z. J. Agric., 1943, **66**: 353-4.
Damage to linen flax by out-of-season hailstorms was particularly heavy in the more southern districts of the South Island of New Zealand during the last two years. When a young plant is hit by a hail-stone near the tender top, the top containing the growing point will be severed from the main stem. As a result lateral branches will arise, incidentally increasing seed production. To less severe bruises further down the stem the plant reacts with callus formation leading to a complete or incomplete node or a scar where the injury occurs. In all these cases the effective fibre length will be reduced. The value of the crop may be seriously affected by hail damage, if it has not to be rejected altogether for fibre production.

1362. Bell, G. D. H., and Bauer, A. B. 612.014.44: 633.63
Experiments on growing sugar beet under continuous illumination* III. The production of a seed crop in the field and the resolution of a heterogeneous population.
J. agric. Sci., 1943, **33**: 85-94, bibl. 1.

1. Experiments are described demonstrating a technique for raising sugar beet seedlings under glass during the winter to provide plants for seed production after transplanting into the field. 2. The use of 24-hour illumination for this purpose is discussed, and the effect of this illumination in resolving a heterogeneous population is described. 3. The association between the growth habit of the seeding plant and root characters, glomerule yield, weight and size, and the time of anthesis is considered in relation to the recognition of types showing *B. maritima* and *B. vulgaris* characteristics. [Authors' summary.]

1363. Hildebrand, A. A., and Koch, L. W. 633.63-2.19
Studies on blackroot of sugar beet seedlings.
Sci. Agric., 1943, **23**: 557-67, bibl. 17.

1364. Markwood, L. N., and Barthel, W. F. 633.71: 615.783.22
Tobaccos classified according to nature of their alkaloids.
J. Assoc. off. agric. Chem., Wash., 1943, **26**: 280-3.

A method is presented for classifying tobaccos according to the nature of the alkaloids. Powdered tobacco is treated with sulfuric acid (9+1), water is added, and the mixture is warmed, then cooled and filtered. The filtrate is made strongly alkaline and extracted with benzene; the benzene extract is then extracted with 0·1 N hydrochloric acid. The alkaloid picrate is formed and its melting point taken. According to the melting point, tobaccos are classified as follows: Nicotine type (m.p. 215°-224° C.), mixed type (m.p. 190°-215° C.), and nornicotine type (m.p. 175°-200° C.). Nearly all of the 90 samples of tobacco tested, including *Nicotiana rustica*, belong to the nicotine type. Two specimens of the nornicotine type are recorded; one, Maryland tobacco known as Robinson's Medium Broadleaf, was previously known to be of the nornicotine type; the other, Flue-cured, Cash (Moss 1937), is reported for the first time. [Authors' summary.]

1365. Haley, D. E., and others. 633.71-1.8
The yield and composition of cigar-leaf tobacco as influenced by fertilizers and preceding crop.
Bull. Pa agric. Exp. Stat. **440**, 1943, pp. 21, bibl. 3.

Experiments on tobacco, carried out for 9 years clearly indicated that the effect of fertilizers upon yield and composition of the cigar-leaf are overshadowed by the influence of the preceding crop. Moisture demands of the cigar filler type were found to be at least double and the nitrogen and potassium requirements two to four times those of other tobaccos. However, even relatively large applications of those nutrients could not raise the nitrogen and potassium content of the leaves to the required standard. To a certain degree the intake of nitrogen and potassium appeared to be governed by the quantity of available soil moisture. The maintenance of a good tilth and frequent supply of both manure—plant or animal—and fertilizers are necessary to obtain a high level of production. Rotation experiments showed that the influence of maize was definitely superior to that of legumes as a preceding crop with respect to yield, quality and uptake of nutrients. Growers' experiences that lucerne stubble has a depressing effect on the following cigar-leaf tobacco crop were confirmed. Well distributed rainfall modified the unfavourable influence of a preceding leguminous crop. Tobacco following maize was less susceptible to leafspot than tobacco following legumes.

* Previous paper *J. agric. Sci.*, 1942, 32: 112-41, bibl. 12.

1366. Scott, L. B., and Milam, J. 633.71-2.951
Cryolite injury to tobacco seedlings.
J. econ. Ent., 1943, **36**: 335.

In a previous paper (*ibidem*, 1939, 32: 469) the use of cryolite had been recommended by the authors for the control of the corn root webworm, *Crambus caliginosellus*, on tobacco seedlings. Subsequent tests showed that cryolite treatment may under some conditions injure the seedling roots.

1367. Price, W. C. 633.71-2.8
Severity of curly top in tobacco affected by site of inoculation.
Phytopathology, 1943, **33**: 586-601, bibl. 21.

The severest symptoms were invariably produced when the insect vector, the leafhopper, *Eutettix tenellus*, fed on tissues near the growing point. Only mild or moderate symptoms occurred when it fed lower down. These results are similar to those obtained in transmission by grafting and seem to indicate that variability in severity of the symptoms thus produced is at least not due to any protective substances transmitted through the graft union.

1368. Brannon, L. W., and Reed, W. D. 633.71-2.617
Survey of tobacco carriers for stored-tobacco insects.
J. econ. Ent., 1943, **36**: 295-9.

69 ships, 146 railway cars and 59 lorries were inspected by the U.S.D.A. Bureau of Entomology and Plant Quarantine at Hampton Roads, ports of Norfolk and Newport News, Va during the last quarter of 1939 in order to determine the importance of tobacco carriers in disseminating the tobacco moth and the cigarette beetle. No insects were found in lorries and in ships taking American tobacco abroad, but imported foreign grown tobacco was, as a rule, infested, exposing home grown tobacco to infection. Although railway cars were initially free from tobacco moths, live insects were found at the end of the journey, having flown into the cars during loading. This represents a source of danger to warehouses.

1369. Goodspeed, T. H. 633.71
El tabaco y otras especies del género nicotiana. **(Tobacco and other species of the genus *Nicotiana*.)**
[English summary.]
Bol. Facul. Agron., B. Aires, **22**, 1942, pp. 21.

Markwood, L. N. 615.783.22
Quantitative determination of nicotine and nornicotine in mixtures.
J. Assoc. off. agric. Chem. Wash., 1943, **26**: 283-9.

Brubaker, R. W., and Reed, W. D. 633.71-2.944
Fumigation of tobacco at reduced pressures.
J. econ. Ent., 1943, **36**: 300-3, bibl. 6.

Kumar, L. S. S. 633.71-2.53
Flowering crops which attack economic crops. II. *Orobanche* [broomrape].
Ind. Fmg, 1942, 3: 638-40.
Damage and control measures.

1370. Beard, F. H. 633.79
Commercial varieties of hops: a preliminary comparison of their chief characteristics at East Malling.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 75-83, bibl. 9.

An account is given of the investigations so far made on the commercial varieties of hops. Whilst Fuggle, Colgate and Tolhurst are distinct varieties easily identified, the true Goldings, though clearly distinguishable from non-Goldings, show only minor differences between themselves. Seven clones raised from Goldings received under different names have shown differences in season, size of cones, number

of petals, number of glands on the leaves, resin content of cones, slight variation in bine colour, and susceptibility to disease. The similarity between the Goldings is explained on the assumption that all are derived as bud-sports from a common parent type. A cropping trial with three clonal strains of Fuggle has shown differences in yield and resistance to frost injury.

1371. BEARD, F. H. 633.79: 581.144.2
Root studies. X. The root-systems of hops on different soil types.
J. Pomol., 1943, **20**: 147-54, bibl. 10.

The root systems of a number of hops were excavated by the skeleton method by which means the position and depth of each root are recorded on a plan and the root system is afterwards reconstructed and photographed. The soil profile and the root system for each excavation are described. Each soil type, of which there were several, induced a root-system characteristic for the type. These modifications are compared with those of apple tree root systems under the influence of soil conditions. Two types of hop roots were observed: (1) horizontal, tough and wiry, with much small root and fibre; (2) vertical, fleshy and brittle, with little branching and no fibre. The proportion of each type of root was found to be governed by soil conditions. The text is well illustrated with root plans and photographs.

1372. BEARD, F. H. 633.79-1.542
Cultural trials with hops. III. The effect of "stopping" and number of bines per string on a vigorous late variety (OV7).
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 70-2, bibl. 1.

Recent trials show that, when using the Butcher system of wirework, although stopping of the bines of hops at the lacing string about 9 ft. from the ground with subsequent training up of laterals prevents the undesired formation of heads over the top wire, it does cause a reduction in yield. Over a 5-year period reduction was greatest where 1 bine was trained up each string and least where each string was furnished with 3 bines. When OV7, a vigorous variety, was grown without stopping, 1 bine per string gave yields not significantly lower than those of 2 or 3 bines per string. The possible commercial application of these findings is discussed.

1373. BEARD, F. H. 633.79
A comparison of the performance of sets and cuts of hops when planted in their permanent positions.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 73-5, bibl. 1.

Cuts or strap cuts are the swollen bases of the past season's bine. These are sometimes planted direct into permanent quarters and sometimes in a nursery to form sets which are lifted at the end of the season and planted out in the hop garden. A comparative trial of the merits of planting cuts or sets was made with 7 new varieties at East Malling. In both seasons of the trial the cuts showed a heavy mortality, whereas the sets gave a 100% take with all varieties except one which showed a mortality of 2%. There were varietal differences in cropping which was higher in the sets. It is suggested that in view of the year saved, and provided a good take is obtained, cuts may be preferable in planting strong varieties. With the weaker varieties and especially under unfavourable conditions (wireworm, etc.) sets are preferable, provided the nursery soil in which the sets are formed has not previously carried wilt-susceptible crops (e.g. potato, hop, etc.) and is adequately isolated from diseased plantations. Such happy conditions are, however, infrequent.

1374. SALMON, E. S., BEARD, F. H., AND HATTON, R. G. 633.79
The merits of the new varieties of hops.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 108-12, bibl. 17.
See *H.A.*, 13: 488.

KEYWORTH, W. G. 633.79-2.411
A *Phytophthora* disease of the hop in Great Britain.
A.R. East Malling Res. Stat. for 1942, **A26**, 1943, pp. 62-3, bibl. 2, being reprinted from *Gdnrs' Chron.*, 1943, **113**: 238, see *H.A.*, 13: 896.

1375. BERGSTRÖM, I. 633.859-1.531.17
Ett förberedande försök med betning av oljevallmo. **(A preliminary disinfection test with oil poppy seed.)**
Växtskyddsnotiser, 1942, Nr. 2, pp. 28-9.

The disinfection of oil poppy seed was studied in a preliminary laboratory test at the Plant Protection Station, Stockholm, following observations that a root blight of poppy seedlings, caused by *Pleospora calvescens*, was assuming serious proportions. Dipping the seeds in 1·5 to 3% aqueous solutions of the usual disinfectants checked the disease without impairing the germination power, whilst dry disinfectants gave less good control. Study of the disease in field trials is planned.

1376. BEGGS, J. P. 633.854.54
The linseed crop in North Canterbury.
N.Z. J. Agric., 1943, **67**: 11-3.

About two-thirds of the linseed grown in New Zealand is produced in North Canterbury. The best rotation is that in which linseed follows grass and is followed by wheat. The best soil and climatic conditions for linseed are discussed and the cultivation of the crop is described. 10 to 12 cwt. of seed per acre may be called a good yield.

1377. ANDRÉN, F. 633.854.54-1.531.17
Ett betningsförsök med linfrö. **(Seed treatment of linseed.)**
Växtskyddsnotiser, 1942, Nr. 1, p. 15.

An accidental result of disinfection experiments with linseed carried out at the Plant Protection Station, Stockholm, was the observation that the disinfectant had a marked stimulating effect on germination. In later stages of development plants from treated seeds were even more markedly superior to untreated plants. 175 g. of the oil dip Panogen per 100 kg. seed or any of the dry disinfectants listed in the Station's Flygblad Nr. 58, 1942, are recommended as stimulants. Dipping in aqueous solutions is not suitable for this seed.

1378. HOWES, F. N. 633.913
Russian rubber plants.
J. roy. hort. Soc., 1943, **68**: 305-6.

Seed of the three Russian rubber plants, kok saghyz, krim saghyz and tau saghyz was distributed from Kew to some 20 experiment stations in Great Britain. Kok saghyz grows vigorously in good soils once it has passed the prolonged and very delicate seedling stage. Subjecting the seeds for a fortnight to a temperature of 2° C. before sowing improved germination. Vegetative propagation from root cuttings, as recommended by Russian scientists, did not meet with much success at Kew, probably because the plants then available were too small. Kok saghyz needs the same cultivation and attention as a vegetable crop. Selection may play a part in increasing the yield of rubber which is at present far below that of the better known rubber plants. The raising of krim saghyz from seed offers no difficulty. Since 2 to 4 years are required to develop the rubber content of the root fully, it is not yet known if this plant of Crimean origin will withstand average British winter conditions. Very poor germination and great susceptibility to pests and diseases in tests at Kew may exclude tau saghyz from cultivation in Britain.

1379. HALL, H. M., AND GOODSPEED, T. H. 633.913
A rubber plant survey of Western North America.
Univ. Calif. Publ. Bot. 7, 1919, reprinted 1942, pp. 159-278.

I. *Chrysothamnus nauseosus and its varieties.* This shrub, known as rabbit brush and widely distributed in Western

North America, is exceedingly variable, at least 40 forms having been described, and all but 6 at one time or another have been given specific rank. The senior author who was engaged on a revision of the group describes 22 varieties. II. *Chrysil, a new rubber from Chrysothamnus nauseosus.* The name Chrysil is proposed for the rubber extracted from this shrub. The rubber is mostly contained in cortex cells in the stem parts which are 3 years old or more. It is not a latex rubber. A number of localities in which the plant is common are described. Microscopical methods of detecting the presence of rubber and of determining its amount are described and there are 7 pages of tables giving the results of 180 chemical analyses and 80 microscopical examinations of various parts of the plant and of plants from different localities. These indicate an average of 2·83% rubber in the variety *hololeucus* with lower percentages for other varieties. The two absolute highest percentages were 6·57% in a plant of *consimilis* from Nevada and 5·56% in a *viridulus* from California. The rubber is in greatest amount at the soil line, there being little in the young shoots and in the lower parts of the tap root. The best rubber-bearing varieties grow on alkaline soil. The whole plant including 4 inches of tap root should be harvested and the smaller twigs trimmed away. The suggestion is made that cultivated varieties could be regenerated if a stump were left in the ground. The plant could be grown on the alkaline plains of the West without irrigation. Some varieties will withstand great heat and others winter temperatures of −20° F. III. *The occurrence of rubber in certain West American shrubs.* In at least 2 species of the allied genus *Haplopappus* the root and stem bear equal amounts of rubber (*H. nanus*) or the root carries almost the entire amount (*H. ericoides*).

1380. Mynbaev, K. 633.913
Method of improved cultivation of *Taraxacum kok saghyz*. [Russian.]
Sovetsk. Agron. 1940, No. 11-12, pp. 63-8.

Although at present (1940) tens of thousands of ha. have been planted with *T. kok saghyz*., the expansion of the area under cultivation was not accompanied by a corresponding rise in the yield of roots. Thus for the two years, 1938 and 1939, the average crop of roots for the whole of the U.S.S.R. was 1·7 and 4·2, and 2·0 and 3·8 centners per ha. from one- and two-year-old plantations respectively. In the light of evidence gathered in 1937-39 from a number of localities in different territories of the Soviet Union where the plant was cultivated on a large scale, the author attributes one of the causes of low root yield to the excessive density of planting. In accordance with existing instructions the seeds are sown in rows spaced at 44·5 cm., at a rate of not less than 3 kg. per ha. Assuming that only 60% of seeds germinate and that 50% of plants perish while young, the author calculates that the density of adult plants will be about 2 million plants per ha. As the average distance between individual plants is about 0·3-0·4 cm., the roots interweave, assume grotesque forms, and the plants struggling for moisture and nutrients develop badly and give poor yields. In experimental plots where all the other conditions, except the number of plants per ha., were exactly the same as in ordinary plantations, the yield of rubber during the three years 1937-39, from the stands containing only 250 and 500 thousand plants per ha. was 85 and 165, 157·5 and 155·0, and 70·0 and 120·0 kg. per ha. as against 105·0 (1·5 million of plants per ha.), 150·0 and 99·0 (1 million per ha.) kg. per ha. in the controls. This increase in output was due to (*a*) a greater weight of individual roots and consequently to a relatively larger total yield of roots; and (*b*) a higher content and absolute yield of rubber per root. Somewhat similar ratios were obtained when NPK fertilizers were applied, either together or separately, to both thin and dense stands. For practical purposes the author recommends planting from 300-400 thousand plants per ha.; the planting should be done in rows spaced at 45 cm.; in each row there should be, at intervals of 10·15 cm., 2-3 lines of seedlings, so that each plant has an area of about 10×10 or 10×15 cm.² from which to draw nutrient material. Such methods ensure normal development and growth of individual plants, give the rubber plants a better chance to overcome competition from non-rubber bearing species of *Taraxacum* (a weed pest of plantations) and thus result in good yields of roots and rubber.

1381. Kalinkevič, A. F. 633.913-1.8
The application of fertilizers to the rows in (kok saghyz) plantations. [Russian.]
Agrotehnika, 1940, No. 3, pp. 72-81.

As the seeds are very small and contain but a little store of nutrient materials, the young seedlings grow slowly and respond favourably to mineral fertilizers. The experiments carried out in 1939 at the Prjanisnikov's laboratory, Gedroic Federal Research Institute of Fertilizers, Agricultural Technique and Soil Science, showed that *Taraxacum kok saghyz*, in the germination and seedling phases, has low N, high P and increased K requirements, both in water and field cultures. The development and growth of plants was accelerated, and the yield of seeds and roots increased when the full NPK, in doses of 10, 20 and 30 kg. per ha. in weakly degraded black-earth soils, was applied to the rows in a year-old plantation. The influence of varying doses of fertilizers on the growth and development of the plants and on the rate of accumulation of rubber in the roots is illustrated by 10 figures and there are 14 tables in which the statistical evidence is summarized.

1382. Nejman, G. B., and Dobrovoli'skaja, N. N. 633.913
The accumulation of rubber in *Taraxacum kok saghyz* during storage. [Russian.]
Proc. Lenin Acad. Agric. Sci. U.S.S.R., 1940, No. 22, pp. 29-32.

Tests were carried out with the roots of the plant over a period of storage lasting 135-153 days (from November to April); they were stored in bulk at 0·5° to −5·8° C., in eight heaps, each 10, 2, and 1·25 m. long, wide and high respectively, and the samples, buried to a depth of 50 cm., together with those obtained from different parts of each heap, were analysed regularly throughout the period. In ten out of sixteen samples there was a considerable increase —12%, 20% and 50% of the initial rubber content—in the total store of rubber in the roots. The majority of roots—owing to their great power of regeneration—sprouted during storage and remained viable, as proved by the fact that they contained latex. Since it had been shown by other investigators that removal of leaves did not inhibit the accumulation of rubber in the roots, the explanation is given that the synthesis of rubber does not exclusively depend on the process of photosynthesis and may continue—at some undetermined rate which is to form the subject of further investigations—in its absence during storage. In the six remaining samples, in which a decrease of the rubber content occurred as a result of storage, the diminution was due to the putrefaction of the roots and their having been attacked by moulds; a view is expressed that losses of rubber due to this cause could be prevented by suitable storage conditions.

1383. Skarbilovič, T. S. 633.913
Nematode pests of *Taraxacum kok saghyz*. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1940, No. 23-24, pp. 47-9.

Pot experiments—with soil obtained from commercial plantations of *T. kok saghyz*—showed that the roots of seedlings sown on 9th June were attacked on 17th June by nematode. It would appear that *Anguillulina pratensis* and *A. multicincta* have a predilection for the roots of seedlings, for the parasites were not found on the roots of adult plants, the latter being attacked by *A. dipsaci*, *Aphelenchoides parietinus* and *Aphelenchus avenae*. 32% (39 seedlings) were attacked by nematodes, sometimes by the two species

simultaneously; on five adult plants a total of 1,270 eelworms, belonging to ten species, was found.

1384. KULI'TIASOV, M. V. 633.913: 576.16
The questions of the origin of *Scorzonera tau saghyz* in the light of new facts. [Russian.]
Sovetsk. Botan., 1941, No. 3, pp. 21-9.

This is an early survey in which the author discusses the geography and evolution of the new species, *Scorzonera kirghisorum* C. Afan., discovered in 1937 by Afanasi'ev on mountain sides in the Eastern Turkestan range at an altitude of 1,900-2,100 m. A new expedition in 1938 brought to light certain new facts. As the latex is yellow in colour and the species is attacked by somewhat similar insect pests, it is thought to be closely related genetically to other species found in the Kara Tau and Kuiuk Mountains: *S. karatavensis*, and *S. longipes*, but not to *S. tau saghyz*. The bulk of the paper is devoted to the taxonomical and palaeontological evidence relevant to the main argument. It apparently bears out the assumption that a close relationship between the geographically isolated forms is due to the penetration to this region of their ancestors in the pliocene epoch, and their dispersal and separation in the subsequent geological periods.

1385. SCHULTZ, E. F. 633.913
La vara de oro "*Solidago*" spp. **(Golden rod as a rubber plant in Argentina.)**
Rev. industr. agric. Tucumán, 1942, **32**: 340.

The *Solidago* genus contains at least 130 species, mostly in Europe and North America. *S. microglossa* is indigenous to woodland in Tucuman and seed is available. It is not thought that the latex content would be sufficient to make attention from the Tucuman Experiment Station worth while and also the plant is very subject to attack by pests and diseases which destroy a great many of the most useful leaves.

1386. SCHULTZ, E. F. 633.913
Las posibilidades de producir goma en el pais. **(The possibilities of rubber production in Argentina.)**
Rev. industr. agric. Tucumán, 1942, **32**: 336-7.

The possibilities of a number of plants both indigenous and exotic as a source of rubber in Argentina are considered. None is likely to be useful except *Manihot glaziovii*, or Ceara rubber. Seed of this tree has a short life and would have to be freshly imported from its habitat, Ceara, in Brazil.

1387. ŠCEPOTI'EV, F. L. 633.917: 581.162
The biology of flowering of *Euonymus nana* M.B. [Russian.]
Sovetsk. Botan., 1941, No. 3, pp. 130-5.

This paper deals with the structure of the flower of *Euonymus nana*, the character and nature of its flowering, the mode of its pollination and fruit set and the ripening of the fruit which occurs in August.

1388. VAŠKULAT, P. N. 633.917
On the varieties of *Euonymus verrucosa* and on the accumulation of gutta percha. [Russian.]
Sovetsk. Botan., 1941, No. 3, pp. 128-30.

The extensive study of this polymorphic species began in 1932-33 at the Experimental and Productive State Farm of Exotic Plants, in the Forest-Steppe Zone in the Orel territory. It was noted that the root bark of the varieties with green flowers contained an average of 15·8% gutta percha with a proportion of gutta to resins of 15·8: 5·9%; that the plants with brown flowers had 9·5% of gutta and the ratio of gutta to resins was 9·5: 6·8%. At the same time, the cuttings of the more productive plants did not take root so readily as those yielding the lesser quantity of gutta percha. When, however, the shoots of the former were pressed quite close to the ground and covered up with earth, they produced a number of additional roots and subsequently rooted quite well; they contained, in the fifth year, just as much gutta percha and resins, and in the same proportion, as the controls which were not so treated. It is concluded that this simple cultural method would considerably enhance the value of the plant as a source of raw gutta-percha.

1389. NAHAPETJAN, A. A., AND NAHAPETJAN, L. K. 633.917
A study of the gutta percha content in the species of *Euonymus* in the Georgian S.S.R. [Russian.]
Sovetsk. Botan., 1941, No. 3, pp. 124-8.

A number of analyses of the gutta percha content in the bark of roots and overground parts of four species of *Euonymus*, commonly growing in the wild state in the Georgian S.S.R., yielded the following data: 1. *E. europea* had the maximum gutta percha content (11·22 to 11·58%) in the bark of roots gathered in June, and the minimum (6·81 to 8·08%) in October; the view is expressed that as the vegetative period proceeds the rubber content diminishes; the bark of stems did not contain commercial quantities of gutta percha. 2. *E. verrucosa* yielded 8 to 14·81% gutta percha from the bark of roots, but only insignificant quantities from that of the overground parts of the plant. 3. In *E. latifolia* the rubber content varied from 9·08 to 11·73%, and the bark of the stems, although containing a lesser percentage of gutta than that of the roots, had an appreciable quantity, thus making it a commercially advantageous source of the raw material. 4. In *E. sempervirens* the rubber content (6·85 to 7·05%) was lower than in the above three species.

1390. LORENZ, O. A. 635.11: 632.19
Internal breakdown of table beets.
Mem. Cornell agric. Exp. Stat. **246**, 1942, pp. 42, bibl. 33.

Internal breakdown was studied at Ithaca. The soil was obtained from two severely boron-deficient fields, 300 lb. being placed in two containers, about 18 in. deep. Borax was applied to both soils at rates of nil, 25, 50, 100 and 200 lb. per acre and to one soil also at the rate of 300 lb. The investigations confirmed previous results that availability of boron is closely related to soil moisture. If the soil moisture was low, applications of 300 lb. of borax per acre produced only slight injury to the table beet plants, whilst in a moist soil 100 lb. and for seedlings 50 lb., broadcast, proved toxic. Increase in growth was noted when the concentration of boron was increased beyond 0·01 p.p.m. and calcium kept constant at 10 p.p.m. or when calcium was increased and boron was kept at a concentration of 0·01 p.p.m. Increments of boron produced a greater effect at lower calcium levels than at higher levels. Plants grew just as well in solutions containing a very small amount of calcium and a large amount of boron as in solutions where the ratio was reversed. In the latter case the absorption of calcium, being closely related to the increase in growth, was 15 times that of the first case. These as well as previous results of other workers suggest that boron in some manner helps the plant to absorb and utilize calcium and that growth depends on the utilization of this element rather than on its absorption, which is chiefly determined by the amount of calcium available. In a second experiment, where deficient light prevailed, utilization of calcium and therefore growth of plants in the 0·01 p.p.m. boron 10 p.p.m. calcium treatment was much greater than in the first experiment. The increase of boron, however, from 0.01 p.p.m. to 0·1 p.p.m. increased utilization of calcium also under conditions of reduced light. The interaction between boron and potassium was found to be very similar to that between boron and calcium with the difference that boron increments increased plant growth to a greater extent at high potassium levels than at lower levels of that element. Plants grown in solutions containing 0·025 p.p.m. of boron and 14·7 p.p.m. of potassium were deficient in both elements. Analyses of breakdown and normal tissues of the same plant and of plants from soils of different boron contents showed no significant differences. Micro-chemical tests, however,

revealed boron deficiency to be associated with a reduction of pectic staining materials in the intercellular spaces and later with a reduction in cellulosic staining materials. The protopectin-pectin ratio was lower in breakdown tissues than in normal tissues of the same plant, probably owing to lack of protopectin formation. It is suggested that boron deficiency has the effect of preventing the formation of certain compounds such as protopectins. Normally boron may act as a catalyser in the formation of a protopectic substance such as calcium pectate. Anatomical symptoms of boron deficiency were manifold. A brown gum-like substance accumulated in the intercellular spaces of young leaves, petioles and roots. Disintegration of parenchymatous tissue and lack of differentiation of vascular bundles in the roots as well as limited growth of secondary roots were among the further symptoms noted.

1391. ODLAND, M. L., AND PORTER, A. M. 635.11
A study of methods of planting beets.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 255-8.

1392. STEWART, R. P. 632.76: 635.12
A modification of the flea beetle trap.
J. roy. hort. Soc., 1943, **68**: 275.
Mr. G. F. Wilson's flea beetle trap (*ibidem*, 1943, 68: 106-7; *H.A.*, 13: 462) was improved upon by adding two splayed pieces in front to project beyond the runners. This was easily done by chamfering the side pieces and the runners in front and putting on two pieces of butter box. The majority of the beetles jumped off the plants when the original device was used, but the improved machine gave very good results in heavily infected turnip fields. The description is supported by an illustration.

1393. SAKR, EL S., AND THOMPSON, H. C. 635.13: 551.52: 612.014.44
Effect of temperature and photoperiod on seed-stalk development of carrot.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 343-6.
French Forcing carrots which had reached edible maturity were grown on in various temperatures and photoperiods at Cornell University. Length of day did not appear to be a very important factor in the initiation of flowering in the mature carrot. The lowest greenhouse temperature, 50° to 60° F., was the most favourable for seeding.

1394. BIOLOGICAL BRANCH, DIVISION OF SCIENCE SERVICES, N.S.W. 631.531: 635.13 + 635.11
Rotting of carrot and beet seed roots.
Agric. Gaz. N.S.W., 1943, **54**: 223.
Collapse of the main storage roots of several transplanted carrot and beet seed plots in New South Wales was believed to be due to selection of over-mature roots of high sugar content as seed roots. Plants should, therefore, be selected and transplanted as early as possible. The characters of colour, shape and habit of growth can be judged when the roots are half or three-quarters grown, a stage at which they will re-establish themselves readily.

1395. RALEIGH, G. J. 635.13: 631.8: 577.15.04
The effect of manures, nitrogen compounds and growth promoting substances on the production of branched roots of carrots.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 347-52.
The addition of cow urine or horse urine to complete nutrient solutions to supply 1% or over caused marked branching of the roots of young carrots growing in sand at Cornell University. An application of growth substances at fairly heavy concentrations, 15 parts per million and in the case of naphthaleneacetic acid also at 5 parts per million, caused marked root deformity but not typical branching. Urea, ammonium hydroxide and ammonium carbonate all caused branching similar to that caused by urine. In the field, plots fed with chicken manure or cow and horse manure containing urine produced more branched roots than plots without manure but results were not conclusive. In soil in the greenhouse a mixture of cow manure and cow urine caused branching. Heavy watering after application reduced the amount of branching. Field experiments are continuing.

1396. WOODMAN, R. M. 635.25: 631.84
Nitrogen nutrition of the onion.
Ann. appl. Biol., 1943, **30**: 116-7, bibl. 4.
In culture experiments at the Horticultural Research Station, Cambridge, Unwin's Reliance onion in sand gave the best bulb production when the range of concentration of nitrogen was 16·48-32·96 p.p.m.

1397. CHAMBERLAIN, H. DE O. 635.25
Onion growing in the Manawatu.
N.Z. J. Agric., 1943, **66**: 355.
Referring to an article in *N.Z. J. Agric.* (1943, 66: 17-20; *H.A.*, 13: 508), where Pukekoho and Marshlands are named as the chief onion producing districts of the Dominion, the author states that onion production at Opiki in the southern Manawatu is now catching up and will soon be equal to the two districts mentioned. Most of the areas now growing first class onions with a not infrequent yield of 16-18 tons per acre were taken over in a very rough state. Preparation of the land and cultivation methods are described.

1398. REINECKE, V., AND HAINES, G. C. 635.25
Some hints on onion planting.
Fmg S. Afr., 1943, **18**: 486, 509.
The land for onions in S. Africa should be ploughed or dug some months before planting or, if this is not possible, should undergo early, shallow cultivation at planting. Some manuring is advisable, especially if the soil be light. A bushel of yard manure + 1 lb. superphosphate per 10 sq. yards should be worked into the top 6 inches with a dressing of agricultural lime, 4 lb. per 10 sq. yards, in the case of acid soils. Early ploughing followed by a rest of 6 weeks is an important factor in cut worm control. If this cannot be arranged the land should be baited with cut worm bait after ploughing when the weeds have dried up. Planting furrows should not exceed 2 inches in depth or the bulbs may be retarded and malformed by soil pressure and the presence of air pockets under the bulb. Spacing should be 4 to 5 inches on poor soil and 3 inches on fertile or well manured land. Planting should be done when the soil is moist or in the afternoon as a scorching sun will cause a check to growth. Regular irrigation should be maintained during growth but restricted when the bulb is ripening. The best late varieties for cropping and keeping qualities are Australian Brown and Brown Spanish.

1399. NEWHALL, A. G., LAWRENCE, G. H. M., AND JUSTICE, O. L. 635.25: 632.954
Weed control in onions with dilute-sulphuric-acid spray.
Bull. Cornell agric. Exp. Stat. **784**, pp. 27, bibl. 10.
The cost of hand weeding onions in the muckland of New York State amounting to 15-30% of the total, it seemed desirable to evolve a practicable chemical method of weed killing. Tests undertaken at Ithaca revealed that 2-2½ vol.% sulphuric acid came nearest to the "ideal herbicide", which would kill a great variety of weeds under a wide range of climatic conditions without injuring the onions and would be both inexpensive and easy to handle. In late May and early June, the critical period of the first and most tedious weeding, the grower has to contend with the following weeds, enumerated in the order of their abundance: Pigweed (*Amaranthus retroflexus*), worm seed mustard (*Erysimum cheiranthoides*), lamb's-quarters (*Chenopodium album*), purslane (*Portulaca oleracea*), lady's thumb (*Polygonum persicaria*), ragweed (*Ambrosia artemisifolia*). With the reservation that sulphuric acid slightly reduced the onion stand and failed to destroy weeds difficult to wet, such as

erect grasses, heavy blooming lamb's-quarters and purslane, this spray proved very satisfactory. Its application brought down the cost of weed elimination considerably, the cost of the material being less than 80 cents per acre. The addition of spreaders to improve wetting also increased injury to the onions and had to be abandoned. The method, therefore, cannot be regarded as a complete substitute for hand weeding. The best time for spraying was found to be between the 20th and 30th day after sowing, when the first onion leaf is hardly showing and injury to the expanded cotyledon is immaterial. Since the killing effect is best when the weeds are in a fast-growing condition, the spray should be applied after a period of several warm days at a temperature of not less than 65° F., the last point being very important. The following technical data are given: In diluting the acid, water should be added to the acid; never the other way round. The best quantity per application was 90-125 gallons per acre or 1 gallon per 300-400 feet of row. A lead-dipped, knapsack, bellows type of sprayer was best adapted to the work; an all-brass knapsack may be a satisfactory substitute. A galvanized-iron spray tank was found dangerous. Owing to the low concentrations and small quantities recommended it was important to hold the nozzle close to the ground so as to wet a strip of soil 3-4 in. wide. 10% more seed should be sown where weed control by spraying with sulphuric acid is planned. Other chemicals found less effective as sprays were: iron sulphate, Atlacide (basically sodium chlorate), Sinox (sodium dinitro-ortho-cresylate) and cyanamide dust.

1400. Skripnichenko, L. A. 635.25
Annual cultivation of onion from seed in the White Russian S.S.R. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 3, pp. 103-4.

The technique of raising onions from seed and getting crops from commercial farms of over 200 centners per ha. [about 4 tons to the acre] in White Russia is described. It is stated that the vernalization of the seed is a prerequisite of a good crop.

1401. Stearn, W. T. 635.25
The Welsh onion and the Ever-ready onion.
Gdnrs' Chron., 1943, **114**: 86-8, bibl. 8.

The Welsh onion of 18th and 19th century gardeners was undoubtedly *Allium fistulosum*, the onion-leek or Japanese bunching onion of many present-day British gardeners. The so-called Welsh onion of the present time is a form of the common onion *A. cepa* for which the name of Ever-ready onion or *Allium cepa* var. *perutile* is proposed. It resembles the true Welsh onion (*A. fistulosum*) only in being perennial and producing a very narrow cylindric and not globose bulb. Its floral parts are those of the true onion *A. cepa*. The bulb coats beneath the outermost coats are reddish, the leaves are scarcely 1 cm. broad. Other botanical differences between the two species are pointed out and illustrated. The transfer of name probably occurred when the true Welsh onion (*A. fistulosum*) fell out of cultivation. The culinary uses of *A. fistulosum* are by no means so extensive as those of the Ever-ready onion. The latter has been extensively propagated by Mr. Clarence Elliott at Stevenage who considers it the most easily grown and prolific onion in existence. There are several varieties of each type and these are described.

1402. Wilson, G. F. 635.25: 632.77
A note on the control of the onion fly, *Delia antiqua*.
J. roy. hort. Soc., 1943, **68**: 276-7.

The author at Wisley studied the effect of cultural methods, which may be used in conjunction with calomel treatment, on the control of the onion fly. It was shown that larger bulbs, obtained by autumn sowings and glasshouse raised plants, tend to localize the attack, whilst seedlings are destroyed 20-30 in a line. The explanation for the different behaviour of the maggots is that there is enough food for more than 20 in a more mature bulb, but they have to travel from seedling plant to seedling plant to satisfy their requirements. Fertilizers help in the same manner to hasten bulb growth and to concentrate the maggots on a few bulbs.

1403. Altstatt, G. E., and Smith, H. P. 635.262
Production, diseases, and insects of garlic in Texas.
Circ. Texas agric. Exp. Stat. **98**, 1942, pp. 13.

Among the instructions given for the cultivation of garlic are the following:—The crop should not be grown more than once in 3 years on the same land, on which also no onions should be produced in the meantime. Planting should be shallow, if possible on a ridge, the bulbs should be covered with no more than 1½ in. soil. The harvest should be delayed until the plants are brown. While curing and storing ventilation should be good so as to prevent heating and sweating. The common diseases and insect pests of garlic are dealt with.

1404. Giles, W. F. 635.3
Leaf beets and spinach.
J. roy. hort. Soc., 1943, **68**: 255-9.

Remarks on some vegetables used as spinach, such as: Perpetual spinach or spinach beet (*Beta vulgaris* var.); sea kale beet or Swiss chard or poirée (*Beta vulgaris* var.); Chilean or Brazilian beet (*Beta vulgaris* var.); wild sea beet (*Beta vulgaris*); spinach (*Spinacia oleracea* var.); New Zealand spinach (*Tetragonia expansa*); orache or mountain spinach (*Atriplex hortensis*); mercury or perennial goosefoot or good king Henry (*Chenopodium bonus-henricus*); sorrel (*Rumex acetosa*); corn salad or mâche (*Valerianella olitoria*); broad bean tips.

1405. Ahlberg, O. 632.77: 635.34 +635.13
Råna ftalin mot fluglarver på köksväxter.
(Crude naphthalene for cabbage and carrot fly.)
Växtskyddsnotiser, 1943, Nr. 2, pp. 4-6.

In experiments carried out at the Statens Växtskyddsanstalt, Stockholm, crude naphthalene was found to afford the best control of cabbage, carrot, and, under certain conditions, also of onion fly. Naphthalene does not destroy the maggots, but its vapours act as a narcotic and prevent the flies from laying their eggs in or close to the plants. Cold or windy weather weakens the effect. 3-4 applications at intervals of one week of 30 g. per m², or 5 g. per cabbage plant, or 10-20 g. per 1 m. of carrots or onions, according to the distance of the rows, are the recommended dosage.

1406. Hoecker, R. W. 635.34
The production and marketing of cabbage in New York.
Bull. Cornell agric. Exp. Stat. **780**, 1942, pp. 51.

This survey compiled at Ithaca contains data for 1940 from 184 cabbage growers and 104 retail stores selling cabbage in New York State. Data from 104 questionnaires returned by wholesalers are also reported. Out of the vast amount of statistical figures presented only a few can be quoted in this connexion. For 1921-40 the total cabbage acreage in the U.S. averaged 151,380 per year, and increased at an average yearly rate of 4,977 acres, of which 1,965 were early cabbage. The most important domestic-cabbage-producing State is New York, followed by Wisconsin. Average yields per acre in New York for 1938-40 were 12 tons for domestic cabbage, 11 tons for Danish and 10 tons for red. The number of plants set per acre was 9,402. Principal varieties were, for domestic cabbage: Glory, Danish: Ballhead, red: Red Rock. Usually 500-600 lb. commercial fertilizers per acre of the average composition 4·9-10·2-6·2 were applied in addition to 8 tons of manure. Rotenone was the most used insecticide, 3 sprayings or dustings being the most common number. For 1918-40 the yield was closely related to rainfall, though the fluctuations in yield were not quite so great as those in rainfall. More than 90% of domestic and red cabbage and 64% of Danish cabbage were

sold at harvest during 1938-40. Cabbage of average quality in average storage will shrink 5% per month. About two-thirds of the domestic cabbage was sold to kraut factories. Further subjects dealt with are: marketing by wholesalers, wholesale prices in New York City, retail prices of cabbage, cabbage for sauerkraut manufacture.

1407. GRAY, S. G. 635.34: 581.466
Fasciation in cabbage.
J. Coun. sci. industr. Res., Aust., 1943, **16**: 92.

Pronounced fasciation in the developing flower stalk of Succession cabbage at Canberra grown in connexion with vernalization experiments was probably due to traumatic influence arising from injury to the growing points by the aphis *Brevicoryne brassicae* and not to previous treatment. The plants eventually flowered and set seed freely.

1408. STAHMANN, M. A., LINK, K. P., AND WALKER, J. C. 635.34/36: 632.42
Mustard oils in crucifers and their resistance to clubroot.
J. agric. Res., 1943, **67**: 49-63, bibl. 33.

Re-investigating a claim that mustard oils were responsible for the resistance of certain crucifers to clubroot, the mustard oils occurring in the roots of turnip, cabbage, horseradish, black mustard and white mustard were isolated and examined jointly by the Wisconsin Agricultural Experiment Station and the Bureau of Plant Industry. β-phenethyl isothiocyanate was found in the roots of all the crucifers mentioned, whilst allyl isothiocyanate was not present; but the former is just as toxic to *Plasmodiophora* as the latter, which is better known for its fungicidal action. There was no relation between the quantity of β-phenethyl isothiocyanate present in the root and resistance to clubroot. Improved analytical methods for estimating isothiocyanates were developed in the course of this intensive study.

1409. GRIFFITHS, A. E. 635.52: 631.531
The viability of lettuce seed: a physiological and microchemical study.
Mem. Cornell agric. Exp. Stat. **245**, 1942, pp. 39, bibl. 24.

Storage conditions of lettuce seed were studied at the Boyce Thompson Institute for Plant Research and at Ithaca during the years 1935-1939. Viability could be maintained for 3 years in sealed storage, provided the seeds were desiccated to approximately one-half their ordinary air-dry water content. Air-dry seeds kept better in envelopes than in sealed containers. The moisture content of the seeds was found to be a more important factor than the storage temperature. Raising the first from 5% to 10% was more injurious than raising the latter from 20° to 40° C. Although the moisture content of the seed is closely related to the relative humidity, the seeds were resistant to a relative humidity up to 50% at temperatures up to 40° C. for a period of 32 weeks. At high relative humidities the decline in viability was rapid, even at 0° C. The author found that lettuce seeds have a critical moisture content, which in his case ranged from 3 to 5%, the air-dry water content at Ithaca being 6 to 7%. When the moisture content was above the critical moisture point, temperature became an important factor, higher temperatures reducing viability. The variety New York was more resistant to conditions of high temperature and high moisture than was Grand Rapids. The greater resistance of New York may be due to the highly suberised membrane surrounding the embryo, which in its turn may be responsible for the lower rate of water absorption in this variety. Changes in the suberised membrane at higher temperatures decrease permeability and may cause a state of dormancy. The pH value of embryos was found to be the same in dormant and in non-dormant seeds. Comparing results obtained by different methods of drying the author comes to the conclusion that determinations of moisture content are most reliable if made within 48 hours of drying seeds in a vacuum at 80° C.

1410. HOPKINS, J. C. F. 635.52: 632.1/4
Diseases of fruit, flowers and vegetables in Southern Rhodesia. 7. Common diseases of lettuce.
Rhod. agric. J., 1943, **40**: 239-41, bibl. 3.

The secret of growing lettuce in Rhodesia is to force rapid growth so that the plants mature early while remaining crisp and firm. The chief diseases are damping off, mosaic, tipburn which is followed by internal heartrot and proves fatal, and leaf spot (*Septoria lactucae*). The cause of tipburn is a dislocation in the water balance of the plant; it can be prevented by correct watering.

1411. BODDY, F. A. 635.52: 632.753
The lettuce-root aphis.
Gdnrs' Chron., 1943, **114**: 68.

The lettuce root aphis, *Pemphigus bursarius*, has been troublesome in northern industrial districts, partly, it is surmised, because the common poplar, its alternate host, is so largely planted there. The attacks usually begin at the end of June, the effect on the lettuce being to render it anaemic and stunted and such plants seldom increase in size thereafter. Lettuces Borough Wonder and the Cos varieties seem fairly resistant when attacked, whereas Wonderful, Clibrans' Bronze and Continuity are easily damaged. The most successful methods of control, watering with nicotine, derris or paraffin emulsion, give a reasonable kill but are too expensive for a short season crop. None of the usual deterrent powders such as calomel, naphthalene or soot has been of much use.

1412. THOMPSON, R. C. 635.52: 581.48
Inheritance of seed color in *Lactuca sativa*.
J. agric. Res., 1943, **66**: 441-6.

1413. THOMAS, P. T., AND LEWIS, D. 635.623: 631.531
Vegetable marrow seed production.
J. roy. hort. Soc., 1943, **68**: 313-5.

After two successful years of vegetable marrow growing for seed at the John Innes Horticultural Institution less than 1% of seeds of a third crop germinated. *Sclerotinia* rot, though not isolated from the seeds, is thought to have caused the failure and to have been due to the inclusion of rotten fruits in the fermenting vessel. Seed from healthy plants cleansed separately was viable, whereas healthy seed incubated with diseased seed became infected. The authors summarize their observations of the seed crop as follows:—(1) Remove the first female or the young developing fruit when failure of pollination is suspected. (2) Rigorously discard any unsound fruits. (3) Ferment the seed for a minimum time in a cool place.

1414. ANDROSOVA, M. 635.63: 632.111
The effect on yield of subjecting germinating seeds and young shoots of cucumbers to low temperatures. [Russian.]
Vestnik Ovoščevodstvo i Kartofel', 1940, No. 3, pp. 98-100.

The germinating and sprouting seeds of four local varieties of cucumber were exposed to a temperature of −2 to −2·5°C. for 3 hours without any ill effects; they gave rise after planting in boxes to good strong shoots in 4 days. In a further test 14-day-old seedlings were exposed, in boxes, for 2 to 4 hours to a temperature of −3·3 to −4° C. Out of a total of 934 plants 343 survived, the percentage varying from 14·5 to 55·2 for each kind. In a replicated test 10-day-old shoots were exposed, in a refrigerating chamber, for 2 hours to a temperature of −2·5 to −3° C., left over night at +6° C., and on the following day maintained for 2 hours at −4·5° C.; all the shoots remained healthy; they were subsequently placed in a frame at +10 to +15° C. for 24 days, and later were planted out during ground frost in the open, at which time they carried 1-2 true leaves; flowering began in 24-25 days, and there was a slight preponderance of female over male flowers. In seedlings

of the earlier series, planted out on the same day, flowering began in 7-10 days, the overwhelming majority of flowers were female, fertilization did not occur, and their root system suffered from frost. In a parallel series, where seeds were (1) soaked in water for 17 hours; or (2) soaked in water for 5 hours and exposed, later, to a temperature of −1° C. for 12 hours, the shoots appeared in 4-8 days after planting in the open during ground frost. Only 2·2% to 5·2% of plants that developed from soaked, and 1·8% to 9·4% of those produced from frozen seeds perished. Varietal differences in degree of resistance to low temperatures were noticed. The yield was greater from the plants grown from frozen than that obtained from soaked seeds.

1415. MYERS, C. E. 635.64

The Pennheart tomato.

Bull. Pa agric. Exp. Stat. **438**, 1943, pp. 10.

The new extra early, scarlet-fruited Pennheart tomato is an Oxheart×Penn State Earliana cross. Seven years' tests at many localities proved Pennheart to excel the other early varieties with respect to earliness, percentage of marketable fruit, fruit weight and yield per acre, in yield owing to its compact growth which makes for an optimum planting distance of 2×4 feet. The new variety should neither be staked nor pruned. It is not wilt resistant.

1416. JONES, H. A. 631.523: 635.63+635.64

Hybrid vigor studies with cucurbits and tomatoes.

Chron. bot., 1942, **7**: 265-6.

The article is a review of papers by L. C. Curtis, A. E. Hutchins and F. E. Croston, I. M. Burgess, A. Mayer and N. D. Peacock, R. E. Larson, published in *Proc. Amer. Soc. hort. Sci.* during 1940 and 1941.

1417. HUTTON, E. M. 631.531: 635.64+635.63

A new method for tomato and cucumber seed extraction.

J. Coun. sci. industr. Res., Aust., 1943, **16**: 97-103.

It has recently been discovered at Canberra that the addition of mineral acids, in this case hydrochloric or sulphuric acids, to freshly prepared tomato or cucumber pulp results in a rapid dispersion of the colloidal sac surrounding the seed within a short time of the addition of the acid. The seed is ready for washing 15-30 minutes later. For tomatoes, irrespective of variety, the optimum addition of hydrochloric acid is 100 ml. per 25 lb. pulp and for cucumbers 125 ml. per 25 lb. pulp. Sulphuric acid is cheaper and equally effective though less safe for the inexperienced. To make a suitable solution for treatment of 25 lb. of pulp 30 ml. acid is slowly poured into 70 ml. of water and allowed to cool, before adding to the pulp. Germination of acid extracted seed is more even than that of seed extracted by fermentation. It is possible that seed borne diseases of tomatoes may be checked by this method of extraction. The many commercial advantages of the method are enumerated.

1418. REYNARD, G. B., AND KANAPAUX, M. S. 635.64: 577.16

Ascorbic acid (vitamin C) content of some tomato varieties and species.

Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 298-300, bibl. 7.

At U.S. Southeastern Regional Vegetable Breeding Laboratory, S. Carolina, the highest ascorbic acid values for the 116 lines examined were shown by two small-fruited species, *Lycopersicum peruvianum* with up to 62 mg. per 100 g. of fresh weight of fruit and *L. pimpinellifolium* with 47 mg. The highest value for any *L. esculentum* type was found in one of the pear tomatoes with 50·5 mg. Commercial varieties showed the lower values with Summerset 21·6 mg. at the top of the scale and Bonny Best 11·2 at the bottom. The small size of Summerset fruit, only 1½ cu. in. compared with the 5 to 12 cu. in. of the other varieties may account for the high ascorbic acid content per unit of weight. Some notes are given on inheritance of ascorbic acid content in descendants of original crosses between high and low content parents.

1419. ARNON, D. I., AND HOAGLAND, D. R. 635.64: 581.192: 581.145

Composition of the tomato plant as influenced by nutrient supply, in relation to fruiting.

Bot. Gaz., 1943, **104**: 576-90, bibl. 11.

Biochemical studies on the effect of nutrient supply on the composition of the tomato plant were conducted at the University of California. The analytical data show that the inorganic composition of the fruit—i.e. elements introduced through absorption by the roots—is not easily influenced by fluctuations in the supply of nutrients, provided that no severe deficiencies are involved. In contrast, the composition of the green parts is largely affected by the nutrient solutions. The concentration, on a weight basis, of inorganic constituents is much lower in the fruits than in the leaves, but even more striking are the differences in the relative proportion of these constituents. Potassium is the dominant element both in leaves and fruit, but the calcium: potassium ratio changes from 1: 2 in the leaves to 1: 60 in the fruit, and the magnesium: potassium ratio from 1: 5 to 1: 25. A total deficiency of potassium or phosphorus causes a reduction of these elements in the fruit associated with grave disturbances. Defloration of plants growing in a potassium or phosphorus deficient solution resulted in a higher content of those elements in young leaves. This finding was thought to suggest that the mineral requirements of the developing fruit are satisfied at the expense of the vegetative tissues. Of the latter again the regions of most active growth are capable of accumulating inorganic nutrients. Defloration of plants in complete solutions caused thickening of stems and leaves, proliferation of new growing points at the leaf axils and the emergence on the stem of rootlike structures. At the same time a considerable accumulation of starch was observed in all tissues, of sugars and nitrogen in the stems and petioles. The concentration of potassium, calcium, magnesium or phosphorus was not increased in the leaves following the removal of flowers.

1420. LYON, C. B., BEESON, K. C., AND ELLIS, G. H. 635.64: 631.454: 631.811.9

Effects of micro-nutrient deficiencies on growth and vitamin content of the tomato.

Bot. Gaz., 1943, **104**: 495-514, bibl. 54.

The effect of manganese, copper, zinc, molybdenum and iron deficiencies on the tomato plant as a whole and on the ascorbic acid, riboflavin and provitamin A content of the fruit was studied at the Plant, Soil and Nutrition Laboratory, Ithaca, N.Y. An apparatus for micro-nutritional studies is described which provides an adequate supply of solution for large plants, secures uniform aeration in replicated cultures and protects them against possible impurities from the outside atmosphere. Growth and fruitfulness of the plants were seriously affected by the deficiencies, the symptoms of which are described. The effect of molybdenum deficiency was negligible. Development of a symptom was closely correlated with the distribution of the element in the plant. Iron deficiency raised the ascorbic acid content of tomato fruits by 30%, whilst other deficiencies did not cause the vitamin C content to vary as compared with the controls. Neither did any of the deficiencies affect the riboflavin and provitamin A content significantly. Variations in riboflavin content, however, were found to occur with different positions in the greenhouse and with different dates of fruit ripening.

1421. RAHN, E. M. 631.536: 635.64+635.34

A summary of starter solution experiments on tomatoes and cabbage at State College, Pennsylvania.

Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 305-9, bibl. 2.

The following starter solutions had some success, particularly in increasing early yields of Rutgers tomato and Marion market cabbage, one ½ pint being applied to each plant, (*a*) $2\frac{7}{10}$lb. Ammo.-Phos. $+1\frac{8}{10}$ lb. potassium nitrate, water

50 gal.; (*b*) 1¼ lb. di-ammonium phosphate + 1½ lb. mono-potassium phosphate, water 50 gal.; (*c*) 8 lb. 4-16-4 fertilizer in 50 gal. water; (*d*) for cabbage, 1½ lb. sodium nitrate to 50 gal. water; (*e*) for tomatoes, 6 lb. superphosphate to 50 gal. water. Treatment of the roots of tomatoes at transplanting with 10 parts per million solution of indolebutyric acid or vitamin B_1 had no effect on yield except apparently to reduce it significantly in one case of indolebutyric acid treatment.

1422. SAYRE, C. B. 635.64: 631.536
Starter solutions for tomato plants for 1943.
Bull. N. York agric. Exp. Stat. **706**, 1943, pp. 18, bibl. 6.

Of the fertilizers used in starter solutions for tomato plants, tested at the New York State Agricultural Experiment Station, Geneva, the grade 4-16-4 gave the best results, but the grades 4-10-5 and 4-10-10 were also very satisfactory. The solutions were used at the rate of 10 lb. to 50 gal., applying ¼ pint to the roots of each tomato plant on transplanting. The increase in yield was about 1½ tons per acre. The less acid ammoniated superphosphate was found to be more beneficial in the mixture than the ordinary superphosphate and sulphate of ammonia. Some high analysis mixtures such as the 13-26-13 or the 11-32-14 at the rate of 4 lb. to 50 gal. and the new soluble alkaline 16-48-18 at the rate 3 lb. to 50 gal. are still more effective, but are not readily obtainable at the moment. The ingredients of these latter must not be mixed until ready to use, while stock solutions of all the other mixtures can be prepared in advance. When the solution was applied to the foliage nitrogen apparently was and phosphorus was not absorbed. Leaf treatment was greatly inferior to root treatment.

1423. MACGILLIVRAY, J. H. 635.64: 631.8: 664.84.64
Effect of nutrient root media on loss in weight and amount of rot in stored tomatoes.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 289-92, bibl. 7.

In experiments carried out at the Plant Nutrition greenhouses Berkeley, California, the composition of the nutrient solutions in which the plants were grown did not affect the amount of rot or loss of weight in storage.

1424. WESTOVER, K. C. 635.64: 631.542
Further studies on the effect of topping young tomato plants on fruit set and yield.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: bibl. 3, being *Sci. Pap. W. Va agric. Exp. Stat.* **276**.

Tomato plants grown, before planting out, at 4 inches apart in flats or in 3-inch pots spaced so that the plants were 4 inches apart yielded a significantly greater number and weight of fruit than plants spaced before planting 2 inches apart in flats or in 3-inch pots placed so as to touch. Pot-grown plants consistently but not significantly yielded more than flat-grown plants. Plants which were topped above the second leaf node 2 weeks before planting out showed curtailed early yields, otherwise their reactions to wide spacing and potting were similar to untopped plants, but by the end of the season all differences except that of spacing lacked significance. Topping may be regarded as an emergency measure for holding young plants late in the season.

1425. HOWLETT, F. S. 635.64: 581.162.3: 577.15.04
Fruit set and development from pollinated tomato flowers treated with indolebutyric acid.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 277-81, bibl. 1.

Indolebutyric acid applied in lanolin paste or preferably emulsion at 0·3 concentration to greenhouse tomato flowers from which the styles had not been removed until at least 3 days after anthesis had very favourable results upon fruit set and development, especially in the development of parenchymatous tissue within the locules.

1426. ROMSHE, F. A. 635.64: 581.14
The relationship of stem diameter to the number of flowers, number of fruits and weight of fruit per cluster in greenhouse tomatoes.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 282-4.

On the assumption that plants of moderate vigour are the most fruitful it was thought that stem diameter might form a useful measure of vegetative growth in greenhouse tomatoes. The results with Michigan State and Marglobe indicated that conditions favourable for large stemmed plants (the best correlations being found with measurements taken below the second cluster) are favourable for flower and fruit development. Correlations with Lloyd Forcing which has an English forcing type heritage were more frequently negative.

1427. WHITE, P. R. 635.64: 581.144.2
Ten years of growing excised tomato roots.
Nature, 1943, **152**: 125-8, bibl. 94.

At the Rockefeller Institute for Medical Research, Princeton, New Jersey, an excised tomato root tip has been growing for 10 years. This paper describing its history, accompanied by a chronological bibliography of all papers dealing with the cultivation of excised root tips that the author has encountered, is issued to mark the decennial anniversary. 80,000 cultures, the increment data of which are available, have been made from this clone besides large numbers not recorded. The total measured increments amount to many kilometres, the theoretical increments to the astronomical length of 10^{2800} km. For the first 4½ years, after an initial unsatisfactory formula which nearly ended fatally, the nutrient consisted of a modified Uspenski salt solution, sucrose and yeast extract. The average growth rate now was $6{\cdot}47 \pm 0{\cdot}15$ mm./cult./day with highly significant differences between summer and winter rates. During the next period of 3½ years certain experiments in procedure were introduced, among them the substitution of glycine, thiamin and certain accessory salts for the yeast extract previously employed, all resulting in a slight though not statistically significant reduction in increment rate and a concomitant increase in range of variability to $6{\cdot}06 \pm 0{\cdot}22$ mm./cult./day. More recent changes have introduced a new and improved inorganic nutrient with so far non-significant results and the addition of pyridoxine and niacin to the nutrient, resulting in a sharp increase to $12{\cdot}6 \pm 0{\cdot}8$ for the following year or $+6{\cdot}1 \pm 0{\cdot}8$ over the previous mean rate. There are indications that the nutrient may reduce the degree of variation between the summer and winter cycles. While most of the random week to week fluctuations cannot be explained the causes of some are known. 24 out of the 25 cultures always maintained were once lost through the presence of a trace of lubricating oil in the water; other checks were received from chilling through a sudden fall in outside temperature when the laboratory windows were open, a reduction in iron concentration through a misinterpretation of previous experiments, and the accidental omission of iron from one batch of nutrients.

1428. SHEARD, E. 635.64: 632.19
A fruit blemish of outdoor tomatoes (Stonor's varieties).
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 38-9.

A fruit blemish, confined in some cases to the bottom 2 trusses, appeared on investigation not to be due to spray injury or *Botrytis*.

1429. WALSH, T., AND CLARKE, E. J. 635.64: 632.19: 631.83
A chlorosis of tomatoes.
J. Dep. Agric. Éire, 1942, **39**: 316-25, bibl. 6.

The incidence of chlorosis of tomatoes was observed and studied at University College, Dublin. It was found to occur on soil on which tomatoes had been grown for some years in succession and to be closely associated with the

potassium nutrition of the plant. When potassium was applied every year according to recommendation, regardless of the unused amount left in the soil by the preceding tomato crop, this element accumulated excessively, rising to 1,500-2,000 lb. per acre, expressed as potassium sulphate. Since absorption of potassium is somewhat proportional to the concentration in the soil, luxury consumption by the young plants was the consequence. Under heated conditions chlorosis became first evident in June and July, the first leaves to show symptoms being located at 2-4 feet from the ground. By the end of August all leaves above this region may have become affected. Chlorosis is coincident with the presence of 11-13% of K_2O of the oven dry weight of diseased leaves; it reduces the yield and increases the susceptibility of affected plants to parasitic attacks. These preliminary investigations are to be continued by the authors who are now studying the effect of excessive potassium absorption on the uptake of other elements.

1430. SELMAN, I. W. 635.64: 632.8
Virus diseases [tomato].
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 32-7.

A 3-year study shows that it is usually impossible to ascertain by inspection the source of an outbreak of tomato mosaic infection occurring under commercial conditions and the location of plants first showing symptoms is commonly quite unrelated to any known vector or method of infection. Trials in which varying amounts of potash were added—to soil initially quite rich in potash—indicate that some degree of mosaic infection might be obtained by reducing the dressings of potash normally applied, at least in the case of the variety Potentate. Work with this variety suggests that the following precautions may help to prevent infection: Seed should be taken only from unblemished, soft-ripe fruit of well-grown virus-free plants. Smoking should not be permitted to those handling the plants. Infective debris should be inactivated by steaming or formalin treatment of the soil. The plant should receive no check in its development. Such checks may be caused by dry soil, low temperatures, dry atmosphere, deficiency or lack of balance in nutrients, excess of soluble fertilizers, root diseases. Most of the above tend to affect growth by inducing a shortage of water within the plant.

1431. SELMAN, I. W. 635.64: 632.8: 631.8
The influence of lime and potash on mosaic infection in the tomato (var. Potentate) under glass.
J. Pomol., 1943, **20**: 89-106, bibl. 17.

Flower and fruit production in Potentate tomato inoculated with tomato mosaic virus (A17) when the first truss was in bloom has been compared with that of uninoculated controls, the differences being studied at 2 levels of lime and 3 levels of potash manuring in close relation to those employed in commercial practice. The steam sterilized soil was an old clay loam containing reserves of both lime and potash. The manures used were dried blood, superphosphate, slaked lime and sulphate of potash. The plants were grown to the fifth truss in 10-inch pots under glass. The following results were obtained. Disease symptoms were delayed in inoculated plants where growth was retarded by lime and potash applications. Among uninoculated plants those receiving potash were more frequently attacked than those receiving none, but additional liming did not induce a similar effect. The total number of flower buds were reduced by lime and potash but not by mosaic. The total number of fruits was reduced by mosaic and by liming but was unaffected by the level of potash. Average fruit weight was reduced by increasing the potash and slightly so by mosaic and by liming. The highest total yield of fruit was 7 lb. 0 oz. per plant (4 lb. 8½ oz. ripe unblemished) from uninoculated plants receiving no additional lime or potash and 5 lb. 6 oz. per plant (2 lb. 10½ oz. ripe unblemished) from mosaic infected plants receiving similar treatment. Some effects of mosaic infection were an increase in the number of chats and of blotchy ripening. Omission of potash produced a much greater increase. Stable manure plus potash resulted in a greater reduction of blotchy fruit than potash alone. For reasons which are given it appears the potash requirements of both healthy and mosaic infected plants differ according to their stage of development. High potash manures reduced blotchy ripening in infected plants but increased it in disease-free controls. From a practical point of view potash manuring should be carefully controlled to preserve immunity from accidental infection. In the absence of bulky organic manures lighter potash dressings may increase total yield of both healthy and infected plants though the fruit quality may suffer. There are signs that these results particularly with regard to potash may differ with the tomato variety.

1432. NORRIS, D. O. 635.64: 632.8
Strains of spotted wilt virus and the identity of tomato tip-blight virus with spotted wilt.
J. Coun. sci. industr. Res., Aust., 1943, **16**: 91-2, bibl. 3.

Tomato spotted wilt is shown not to be a virus entity but a complex of closely related strains. Degrees of severity are explained as variations in the ratio of the strains present. The three strains are provisionally known as the necrotic which is the most severe and probably identical with tomato tip-blight, ring-spot which is of medium severity, and the mild. A complete account of the work reported is to be published later.

1433. HILL, A. V. 635.64: 632.8
Insect transmission and host plants of virescence (big bud of tomato).
J. Coun. sci. industr. Res., Aust., 1943, **16**: 85-90, bibl. 9.

Virescence, big bud of tomato, a virus disease, was transmitted by the jassid *Thamnotettix argentata* to 23 species of plants of 13 families. The disease appears to have a wide range of host plants both annual and perennial.

1434. MADHOK, M. R., AND FAZAL-UD-DIN. 635.64: 632.3
Bacterial soft rot of tomatoes caused by a spore forming organism.
Ind. J. agric. Sci., 1943, **13**: 129-33, bibl. 3.

An under-skin soft rot of tomatoes caused by a spore-forming bacterial organism was studied at the Punjab Agricultural College, Lyallpur. The fruit shows discoloration in the early stages and becomes totally disintegrated about 4 days later. Control of the disease was not attempted, the check of such a virulent pathogen offering no prospect of success. It is regarded as likely that the infection occurs in wounds caused by insects.

1435. CASS-SMITH, W. P. 635.64: 632.3/4
Wilt diseases of tomatoes.
J. Dep. Agric., W. Aust., 1943, **20**: 45-53.

Spotted wilt, *Fusarium* wilt and bacterial wilt of tomatoes are dealt with. Describing control measures of spotted wilt separately for commercial growers and home gardeners the first are urged to raise their plants from seeds. It is strongly emphasized that so-called wilt resistant varieties in Western Australia refer only to *Fusarium* wilt.

1436. MCKAY, R. 635.64: 632.41
Tomato root rot. *Colletotrichum atramentarium* (Berk. & Br.) Taubenh.
J. Dep. Agric. Éire, 1942, **39**: 272-6.

A description of the symptoms and control of tomato root rot, supported by 6 good photos.

1437. WILLIAMS, P. H. 635.64: 632.48
***Verticillium* wilt of the tomato.**
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 27-30.

Attempts to determine the resistance of tomato seedlings to *Verticillium* wilt by dipping the roots in a liquid culture

of the fungus and observing the stems for browning were not successful. The degree of resistance of Manx Marvel and Riverside varieties to different *Verticillium* cultures was found to vary.

1438. WILLIAMS, P. H., AND SHEARD, E. 635.64: 632.411
Stem rot of tomato caused by *Phytophthora parasitica*.
Gdnrs' Chron., 1943, **114**: 96-7.

Normally *Phytophthora parasitica* attacks tomato stems at soil level, causing foot rot. In the examples received at the Cheshunt Research Station the lesions were from 1 to 4 ft. above the soil in some cases where there had been obvious mechanical damage, e.g. leaf cutting or abrasions from string, but sometimes when no such damage was apparent. The lesions were elongated, up to a foot in length, not girdling the stem till the disease was well advanced, of a greyish green colour and forming longitudinal folds along the stem (illustrated) owing to the collapse of the tissues within. These tissues were a dark brown which extended a little way above and below the lesion. The disease is to be distinguished from *Didymella lycopersici* by the folding tissue, by the still firm epidermis and by the absence of pycnidia. The source of infection appears to be fruits suffering from buck-eye rot, of which *P. parasitica* is known to be the cause. Such fruits as drop or become mummified should be immediately cleared up or they will continue to infect the present and subsequent crops.

1439. READ, W. H. 635.64: 632.411
Fungicides for the control of "late-blight" (*Phytophthora infestans*) on tomatoes.
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 43-7.

A large number of copper-containing and other fungicides in spray or dust form were tried in 2 series of trials at Cheshunt. Results as regards efficacy of fungicidal power were absent as even the controls were unaffected by blight, but it was possible to note the effects on the plants of the different substances and these are recorded here.

1440. WILLIAMS, P. H. 635.64: 632.48
Tomato leaf mould *Cladosporium fulvum*).
A.R. Cheshunt exp. Res. Stat. 1942, 1943, p. 30.

Results of trials indicate that a strain of *C. fulvum* is now present in this country capable of attacking the Vetomold variety. This should not deter growers from using this variety unless an attack actually develops.

1441. READ, W. H. 635.64: 632.4
***Didymella* (tomato stem rot) investigations.**
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 40-3.

An account of preliminary attempts to deal with the attacks of the fungus in 3 ways: (1) by soil treatment, (2) by preventive fungicides, (3) by treatment of the lesions on the plants. None of these approaches has so far been very successful, but trials are being continued.

1442. SHEARD, E. 635.64: 632.4
A stem rot of tomato caused by *Didymella lycopersici*.
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 30-2.

In the early part of the century "canker" caused by *D. lycopersici* was fairly common, but since 1918 only occasional specimens have been received at Cheshunt. In 1941, however, a serious outbreak occurred in one Lea Valley nursery and this was repeated in 1942. The fungus was reported in 1942 as causing much loss of outdoor fruit. The first sign of the disease is a dark brown lesion girdling the base of the stem just above soil level. Secondary lesions occur higher up the stem. Fruit infection rarely occurs under glass but out of doors infected fruit may be accompanied by stem rot or the stems may be healthy and only the fruits infected. Infection generally takes place at the calyx end of the fruit. The lesion at first appears water-soaked. Pycnidia are formed in the centre of the area and finally a black crust forms and the fruit falls to the ground. Plants were found to be susceptible at all stages of development, although infection took place most readily in older plants. The source of infection is not fully known. The fungus can overwinter in the soil and it was shown in one instance to be present on wire supports and strings removed from an infected glasshouse at the end of the 1941 season and kept out of doors during the winter. The soil, tomato plant remains, canes, wires and strings and the superstructure of the house must all be regarded as potential sources of infection.

1443. PEPPER, B. B. 632.78: 635.653 + 635.64
The relationship between cropping practices and injury by *Heliothis armigera* with especial reference to lima beans and tomatoes.
J. econ. Ent., 1943, **36**: 329-30.

The great increase in the acreage of lima beans in southern and central New Jersey was followed by an outstanding transformation in food habits or host preference of *Heliothis armigera*. In previous years this pest did considerable damage to tomatoes, but tomato fields within a distance of 5 miles from lima beans were found not to be infested owing to the attraction to the adult moths of the beans. Tomatoes further away from lima beans still showed evidence of infestation. In 1942 about 50% of the late maturing lima bean crop was destroyed by the insect in the central New Jersey area. Observations on the distribution of *Heliothis armigera* have been made for 10 years by the New Jersey Agricultural Experiment Station.

1444. ORCHARD, O. B. 635.64: 632.77
Control of the tomato leaf miner (*Phytomyza solani* Macq.).
A.R. Cheshunt exp. Res. Stat. 1942, 1943, pp. 59-61.

Experience shows that it is very important to destroy the pest in the propagation stage, should it then become evident, by removing all infected cotyledons. Application of nicotine should preferably be made by a hand atomizer. Further, when spraying with oil emulsion for red spider nicotine should be added. This spraying in conjunction with the removal of all infested leaflets should prevent serious loss of crop.

1445. CURRENCE, T. M., AND JENKINS, J. M., Jr. 635.64
Natural crossing in tomatoes as related to distance and direction.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 273-6, bibl. 1.

HARTMAN, J. D., AND STAIR, E. C. 635.64: 519
Field plot technique studies with tomatoes.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 315-20, bibl. 5.

KATZNELSON, H., AND RICHARDSON, L. T. 635.64: 631.462
The microflora of the rhizosphere of tomato plants in relation to soil sterilization.
Canad. J. Res., 1942, **21**, Sec. C, pp. 249-55, bibl. 7.

1446. JONES, S. E. 635.646: 632.8
Control of eggplant yellows.
Bull. Texas agric. Exp. Stat. **623**, 1942, pp. 17, bibl. 12.

Eggplant yellows and its control was studied at Texas Substation No. 19, Winter Haven, during the period 1934-39. Although an effective means of control was developed, no explanation of the action of the materials used or of the transmission of the disease could be offered. Eggplant yellows, probably a virus disease occurring during late

summer and autumn in South and Central Texas, appears first when the plants are 8-10 weeks old as yellow spots and then makes rapid progress so that all the green chlorophyll is destroyed in another 25 days. There is as yet no proof of the disease being transmitted by insects, but grafting experiments resulted in infection of a healthy plant after 31 days. Normally infection seems to occur after transplanting and the disease increases most rapidly 6-10 weeks after the plants are set in the field, i.e. during October. Plants grown in spring or early summer remain practically free of the disease. Control measures are quite simple and effective: The eggplants should be kept covered with sulphur dust in the seed bed from the time they emerge until they are transplanted. Sulphur dust is best applied at least once a week and after every heavy rain with a small hand duster or shaken from a cloth sack; 10 lb. of sulphur will suffice for a seed bed large enough to plant 1 acre of eggplants. The last dusting should be given when the plants are pulled to be set in the field. Application of sulphur on already infected plants has no effect.

1447. Weston, W. A. R. D., and Garner, F. H. 635.65

Winter beans in East Suffolk.

Agriculture, 1943, **50**: 268-71.

Although 1943 was a good bean year, there were many failures, particularly in East Suffolk. After discussing cultivation methods and diseases of winter beans, such as chocolate spot and stem rot, the authors suggest that the seeds should be ploughed in early in October or drilling should be done by the end of October, not more than 4 in. deep in rows 18-20 in. apart. Where stem rot occurs neither beans nor clover should be grown for 8 years.

1448. Cass-Smith, W. P. 635.651: 632.451

Bean rust.

J. Dep. Agric., W. Aust., 1943, **20**: 77-9.

In February a serious epidemic of bean rust (*Uromyces appendiculatus*) developed in the Balcatta and Osborne Park districts, constituting the first authentic record of the disease in Western Australia. Plantings on muck or peaty swamp soils, where the atmospheric humidity was high, were more seriously affected than those on light sandy soils under sprinklers. French bean varieties proved highly resistant as compared with runner beans. Symptoms and control measures of the bean rust are described.

1449. Read, F. M. 635.656

Blue pea production in Victoria.

J. Dep. Agric., Vict., 1943, **41**: 225-31.

The armed forces requiring very large quantities of blue peas, this crop was grown for the first time in Victoria on a big scale in 1942-43. Although about one-third of the 3,800 acres devoted to peas by about 150 growers were destroyed or very seriously attacked by cutworms, the yield of 14,000 bags can be regarded as satisfactory for this first attempt. The damage was done by climbing army worm caterpillars or climbing cutworms, as they are more usually called. Dusting with various poisons was undertaken too late, after the worms had already established themselves on the plants. It is hoped that dusting will prove effective in the following season, if applied a few days after the moths have been seen flying through the fields. Some observations suggest that dusting with cheaper non-poisonous materials may render the crop unattractive to the grubs. A straight-sided furrow ploughed around a field was found to prevent the insects from moving from one field to another. The cultivation of blue peas, especially direct-harvesting (mowing and threshing in one operation) with different types of machines is described in detail. The crop is fit to mow when the peas are readily detachable from their stalks in the pod. At this stage they may still be green. Such peas must cure in the field for 1 or 2 weeks. Blue Prussian was the main variety grown in Victoria last year, but the author advocates cultivation of Blue Dutch with a two weeks shorter growing season for the drier Victorian districts.

1450. Hofer, A. W. 635.656: 631.847.2

Effect of inoculation on yield of canning peas in New York State.

Soil Sci., 1943, **56**: 117-26, bibl. 9.

Following reports that inoculation of peas was not profitable in many cases the subject was studied at the New York State Experiment Station during the years of 1936-40. The results confirmed growers' experiences that inoculation is often not beneficial. Trials giving varied results indicate that inoculation should be restricted to fields which have not carried a pea or bean crop for some years. Further investigations into the causes of yield reduction on inoculated fields are in progress.

1451. Walker, H. G., and Andersen, L. D. 635.656: 632.753

Pea aphid control in Eastern Virginia in 1942.

J. econ. Ent., 1943, **36**: 281-5, bibl. 2.

Nicotine dusts and other preparations were tested at the Virginia Truck Experiment Station, Norfolk, in order to find a substitute for nicotine vapours for the control of the pea aphid, *Macrosiphum pisi*. 4% nicotine dusts from Black Leaf 40 and 10 proved satisfactory.

1452. Pizer, N. H., and Glasscock, H. H. 635.8

Experiments to determine the effect of certain wood preservatives on the growth and cropping of the cultivated mushroom (*Psalliota campestris*).

Ann. appl. Biol., 1943, **30**: 128-31, bibl. 5.

In small-scale laboratory experiments carried out at the South-Eastern Agricultural College, Wye, wood treated with the following preservatives and brought into close contact with mushroom spawn had no adverse effect upon growth or cropping: 5% copper sulphate solution, green Cuprinol, 5% Celcure solution, 2% Triolith (Wolman salts) solution. Chromel salt 2% and coal-tar creosote reduced the vigour of mycelium growth to a depth of ½ inch in compost that was in contact with the treated wood but when the wood was only 1½ in. below the casing soil there were no ill effects. Deductions are made from the above results as to the relative safety of the materials in full-scale trials in commercial mushroom houses. It is emphasized that owing to the great range in composition shown by coal-tar creosote the conclusions reached in these experiments should not be applied to creosotes in general.

1453. Anderson, E. E., and Fellers, C. R. 635.8: 613.2

The food value of mushrooms (*Agaricus campestris*).

Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 301-3, bibl. 8.

Mushrooms possess definite food values. The protein is a "partially incomplete" protein similar to gliadin of wheat or hordein of barley. The mineral content provides iron and copper. The plant is an excellent source of nicotinic acid and riboflavin, a good source of pantothenic acid and a fair source of vitamins B, C and K.

1454. Wadleigh, C. H., and Gauch, H. G. 635.652: 631.8

Assimilation in bean plants of nitrogen and saline solutions.

Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 360-4, bibl. 5.

Gauch, H. G., and Wadleigh, C. H. 635.652: 631.8

The influence of saline substrates upon the absorption of nutrients by bean plants.

Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 365-9, bibl. 6.

STARK, F. C., Jr., AND MAHONEY, C. H. 635.652: 581.14
A study of the time of development of the fibrous sheath in the sidewall of edible snap bean pods with respect to quality.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 353-9, bibl. 8.

SCHROEDER, R. A. 635.656: 631.8
Some effects of calcium and nitrogen upon peas.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 375-7, bibl. 2.

PARKER, M. W., AND BORTHWICK, H. A. 635.655: 612.014.44
Influence of temperature on photoperiodic reactions in leaf blades of Biloxi soybean.
Bot. Gaz., 1943, **104**: 612-9, bibl. 5.

HANNA, G. C. 635.31
Correlation studies of asparagus, comparing yields of various shorter periods with ten-year yields.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 321-3, bibl. 5.

HILDITCH, T. P., AND ZAKY, Y. A. H. 633.85: 581.192
The component fatty acids of some vegetable seed phosphatides.
Biochem. J., 1942, **36**: 815-21, bibl. 13.

REWALD, B. 633.85: 581.192
Phosphatides from oil seeds.
Biochem. J., 1942, **36**: 822-4, bibl. 3.

FLOWER GROWING.

1455. EICHMANN, R. D. 635.936.69: 632.73
Tartar emetic for thrips control on greenhouse carnations.
Bull. Wash. agric. Exp. Stat. **417**, 1942, pp. 35, bibl. 26.

Tartar emetic spray used at 1 to 1½ lb. +3 lb. white sugar dissolved in a small amount of hot water and then added to 100 gallons water proved very effective. Methods of use and precautions necessary are detailed.

1456. MCCLELLAN, W. D. 635.937.34: 632.42
Control of powdery mildew of roses in the greenhouse.
Bull. Cornell agric. Exp. Stat. **785**, 1942, pp. 39, bibl. 40.

Fifty different fungicides for the control of powdery mildew of roses (*Sphaerotheca pannosa*) were tested both in the laboratory and under greenhouse conditions at Ithaca. The data demonstrate the superiority of sulphur over copper. Particulate sulphurs in combination with a suitable wetting agent are preferable to soluble sulphurs, which cause foliage burn and hinder photosynthesis. Soluble coppers, however, are also effective in eradicant sprays. Malachite green controls the fungus at a dilution of 1: 10,000, but discolours open blossoms. Sulphur evaporation from steam pipes at 112-115° C. reduced active lesions to 6·8%, whilst evaporation at 85° C. was ineffective. Under conditions of severe attack Vatsol OT proved to be the best wetting agent, but Grasselli Spreader Sticker may be used as a less expensive substitute. Some new methods of measuring effectiveness of wetting agents and of comparing the toxicity of different fungicides are described. An appendix giving data on sources and composition of 63 spray materials and wetting agents adds further to the usefulness of this comprehensive paper.

1457. DUSTAN, G. G. 635.939.98: 632.77
Experiments on the control of the chrysanthemum midge, *Diarthronomyia hypogaea* F.LW.
Sci. Agric., 1943, **23**: 612-24.

The control of the chrysanthemum midge, *Diarthronomyia hypogaea*, was studied at Vineland Station, Ontario, with the aim of reducing the number of sprays necessary for its destruction. It was found that 4 applications at 3 to 4-day intervals of a lauryl thiocyanate spray at a dilution of 1 in 400 gave complete control under cage conditions, provided the whole plant was covered with the insecticide. In the open 3-4 additional applications of a 1 in 600 diluted spray were required to achieve 100% control. To achieve this result it was essential to cover the undersides of the leaves completely. Special tests revealed lauryl thiocyanate to be superior to other materials as an ovicide and as a killer of larvae in the galls. The author recommends winter as the most suitable time for treatment, after the plants are cut back and before making cuttings.

1458. LIHNELL, D. 635.939.124: 632.19 +632.48
Undersökningar över "blad- och grentorka" hos importerade azaleor. **(Investigations into leaf and twig blight in imported azaleas.)** (English summary 10 pp.)
Medd. Växtskyddsanst., Stockh., **40**, 1943, pp. 74, bibl. 28.

The cause of leaf and twig blight of azaleas and its control were studied at the State Plant Protection Station, Stockholm. Symptoms of the disease are shedding of leaves from bottom to top and twig blight spreading from top to bottom. Extensive investigations showed that species of the fungus *Pestalozzia*, present both on diseased and healthy plants, cannot be held responsible for the disorder. Further experiments revealed the disease to be due to poisoning by CO_2 under unfavourable transport conditions. Better ventilation and a temperature of 5°-6° C., to reduce respiration during transport, should remedy the trouble which has caused great loss to the trade.

1459. JOHNSTON, J. P. 632.654.1: 635.939.183
The effect of the hot water treatment for cyclamen mite upon cyclamen plants.
J. econ. Ent., 1943, **36**: 286-9, bibl. 7.

Studying the control of cyclamen mite, *Tarsonemus pallidus*, at the Agricultural Experiment Station, New Haven, the author submerged cyclamen plants in water at 110° F. for 15 minutes. This treatment killed the mites, but injured the plants to an increasing extent when applied after early September. Cyclamen plants can therefore be treated successfully only up to early September and must be carefully protected against reinfestation afterwards.

1460. HAWKER, L. E. 635.944: 632.8
Experiments on the rate of spread of narcissus stripe in the field.
Ann. appl. Biol., 1943, **30**: 184-5, bibl. 10.

By closely interplanting striped and healthy bulbs of several varieties of narcissus previous work in America by McWhorter, indicating that the disease can be spread through contact of injured roots, was confirmed. No insects were observed attacking the foliage and the small amount of infection of plants only 9 in. from diseased bulbs does not suggest transmission by insects above ground, at any rate at the Biological Field Station, Slough. The possibility of such transmission in a moister climate such as Devonshire, as suggested by others, is not hereby precluded.

1461. (ROYAL HORTICULTURAL SOCIETY.) 635.944: 632.76
The daffodil fly.
J. roy. hort. Soc., 1943, **68**: 236-9.

A discussion on the daffodil fly, *Merodon equestris*, was held at a meeting of the Narcissus and Tulip Committee on

13th April, 1943. The passage of the *Merodon* grub to the base of the bulb is somewhat impeded by a sticky soil, but in such cases the grub will make a direct entry into the fleshy scales at the neck of the bulb. Applications of naphthalene to the necks of the plants have some repellent action against egg-laying provided they are often repeated. It was suggested without confirmation that bulbs planted in a hole with sand at the bottom were less frequently attacked. Various measures employed by members to detect and remove the grub were related. The Society's Entomologist, Mr. Fox Wilson, said that the most effective plan was to collect the puparia from the top few inches of soil in April after they had left the bulb. The actual depth at which pupation took place varied with the soil and its humidity. The daffodil fly had several other hosts and infestations of the wild snowdrop had been found far from any kind of cultivated bulb. The wild bluebell, *Scilla nonscripta*, was not a frequent host. Useful measures of control included frequent raking after the foliage had died down, followed by consolidation of the soil round the necks by treading, earthing up and the provision of a mulch of fresh lawn mowings at the same period. *Meredon* did not fly on dull days or even in bright sunshine if there was a strong wind. Sunny, sheltered beds were chiefly infested, while partially shaded beds might escape.

1462. MEHLQUIST, G. A. L. 635.939.183: 581.145.2
Seed production in *Primula obconica*.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 378-80, bibl. 6.

CITRUS AND SUB-TROPICALS.

1463. KRUG, C. A. 634.3
Chromosome numbers in the sub-family *Aurantioideae* with special reference to the genus *Citrus*.
Bot. Gaz., 1943, **104**: 602-11, bibl. 32.

The chromosome numbers of several genera, species and varieties of the sub family *Aurantioideae* were determined by the author and tabulated together with all such figures as were available in the literature. The basic chromosome number is n=9. About 40 triploids, some 190 tetraploids, 1 pentaploid, 1 hexaploid and 14 or 15 aneuploids have been reported. All the polyploids, except 21 tetraploids and several triploid hybrids, belong to the genus *Citrus*. The investigations were carried out at the Instituto Agronômico do E. de S. Paulo, Campinas. An addendum by H. B. Frost explains that some revision of the paper has been made at the University of California Citrus Experiment Station, Riverside, based on the proofs of Swingle's monographic treatment of the *Aurantioideae*. Specific and subspecific names, considered not valid by Swingle, are marked with an asterisk.

1464. PARKER, E. R., ROUNDS, M. B., AND CREE, C. B. 634.31
Orchard practices in relation to yield and quality of Valencia oranges.
Calif. Citrogr., 1943, **28**: 226-7, 238, 242, 260, 268-9, bibl. 1.

A preliminary survey of conditions and practices in 90 Valencia orange orchards was conducted by growers of eastern Orange County, California, for the seasons 1939 and 1940 with a view to establishing any correlations that might exist between them and the yield and quality of the crops. The data were submitted to the Citrus Experiment Station, Riverside, for analysis. *Age*. In trees from 10 to 40 years old no correlation was found between age and yield, fruit quality or fruit size. Trees under 10 years old produced larger and trees over 40 produced smaller fruit than the average. *Rootstocks*. (Sweet and sour stock.) A lower yield in one year only occurred in trees on sour stock. No difference in size or quality could be attributed to rootstock influence. *Manures*. Records of nitrogen and organic manures over a 5-year period did not show any relationship between quantity of nitrogen applied from all sources and yield or quality of fruit or in puffing, hollow centres, granulation or poor colour. The average amount of N applied yearly over a six-year period was 166 lb. per acre. Cover cropping produced no correlations. *Time of picking*. There was a trend towards lower grades as the season advanced. *Soil types*. The lowest yields and smallest fruit were produced on very light and clay adobe soils. *Irrigation*. The analysis suggests that in 1939 the number of annual irrigations (4 to 7) applied over a period of years had some relation to yield, size of fruit and to certain fruit abnormalities. The orchards receiving the least water produced the most and the largest fruit with the least puffing. The amount of fruit with hollow centres progressively decreased with increasing number of irrigations. The same correlations could not all be established in 1940. *Pest control*. No consistent differences could be found between orchards which had been oil sprayed and those which had not during the calendar year in which the crop was gathered, but orchards which had never received any oil spray since 1935 (regardless of other treatment) were better producers in 1939 and 1940 than those oil sprayed annually, and had the largest number of fancy grade fruit. The effects of an increasing number of sprays per season were not consistent but insect injury was always least on those receiving the most oil sprays. Oil sprays had no cumulative effect.

1465. POMEROY, C. S., AND ALDRICH, W. W. 577.15.04: 634.3: 581.145.2
Set of citrus fruits in relation to applications of certain growth substances.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 146-8, bibl. 2.

Attempts in 1938, 1939 and 1940 to increase the percentage of fruit set in Washington Navel orange and Marsh grapefruit at Riverside, Calif., by the application of naphthaleneacetic acid and other growth substances were unsuccessful. The application of pollen from Pernambuco and Foster varieties of grapefruit did result in increased set.

1466. MORTENSEN, E., AND RIECKER, C. R. 634.3-1.541.11
Seed production and seedling yields of some citrus varieties of possible value for rootstock purposes.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 145-8, bibl. 2, being *Tech. Contr. Texas agric. Exp. Stat.* **711**.

The seed yields of a number of varieties of citranges and citrus hybrids planted at Winter Haven, Texas, are recorded, also the seedling yields from a selected few of these. On this basis the Carrizo citrange seems a promising variety for citrus rootstock work in this area having a high yield and consistently good seed production with high germination and yield of usable seedlings. It appears to have good compatibility with Satsuma, Marsh grapefruit and Meyer lemon.

1467. HALMA, F. F. 634.31-1.541.11: 581.192
Rootstock influence on the composition of Valencia orange fruit.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 349-52, bibl. 5.

Eureka lemon rootstock compared with sweet orange stock had a marked dwarfing effect on the Valencia orange in California. It also produced fruit with lower percentage of total solids and acid, a higher acid-solids ratio, a thicker rind but an equal amount of juice. Eureka is not commonly used as a stock. The type selected here is characterized

by early and heavy bearing and by comparatively low vigour. The method of propagation employed was to graft a Valencia twig on a Eureka lemon twig and to root the combination as one cutting. The sweet orange was budded in the ordinary way, but evidence is produced to show that the use of different methods of propagation had no bearing on the result. The general belief that dwarfing rootstocks necessarily heighten fruit quality is not substantiated by these results.

1468. D'Alvarenga, R. S. V. 634.31-1.541.11
Subsídios para o estudo da enxertia da laranjeira "de Setúbal" (*C. sinensis* (L.) Osbeck) sôbre a laranjeira azêda (*C. aurantium*, L.). (**A study of the de Setubal-sour orange graft.**)
Rev. agron., Lisbon, 1942, **30**: 185-213, bibl. 32.
An anatomical and histological study of the union of the sweet orange de Setubal, shield budded, without wood, on sour orange stock and of the effect of plant hormones thereon. Union proceeded normally, differing little from the process as described by Mendel* for Jaffa orange, shield budded on sweet lime. Both natural and synthetic hormones were applied in lanolin, the controls being anointed with lanolin only. The natural wound hormones were obtained from potato, the method being described. The synthetic growth substance was made up of *a*-naphthaleneacetic acid, 3 mg. per g. of lanolin. The effect of the synthetic growth substance was to cause some initial delay in callusing and in cambial union and to increase the percentage of successful unions; buds treated with lanolin alone were generally backward, especially in cambium regeneration below the shield; the use of natural wound hormones from potato delayed healing and did not greatly increase the number of successes. Treated plants developed a smaller proportion of wound gum than untreated plants.

1469. Shamel, A. D., and Pomeroy, C. S. 634.31-1.542
Effects of pruning old Washington Navel orange trees.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 71-6, bibl. 3.
Pruning reduced the yield of old Washington Navel trees during year of thinning with no increase in fruit size. The yield recovered its former position the second year. Pruning before full bloom seems to reduce yield less than pruning after full bloom. The only difference in the physical characteristics between fruit of pruned and unpruned trees was a slightly greater peel thickness and a slightly lower titratable acidity of pruned tree fruit.

1470. Benton, R. J. 634.3-1.8
Manuring citrus trees.
Fruit World, Melbourne, 1943, **44**: 4: 10.
Notes are given on the manuring of citrus in New South Wales. The most suitable mixture for the coastal region is sulphate of ammonia 6 cwt., sulphate of potash 1½ cwt., applied in mixture at the rate of ¾ lb. per tree for each year of the tree's age up to 15 lb. Further inland potash seems unnecessary. Trees benefit by nitrogen when the soil is in good physical condition. 2 lb. of nitrogen or the equivalent 10 lb. of ammonium sulphate for trees of 10 ft. to 12 ft. in height and diameter is suggested. Very large trees may receive 3 lb. of nitrogen. Fertilizers should be spread well beyond the outer fringe of the foliage, not placed close to the trunk and should be turned in to prevent rain wash. Time of application, important in theory, seems less so in practice. For convenience nitrogenous fertilizers may be applied to the cover crop just before ploughing in. When the nitrogen is very soluble, as in sulphate of ammonia or nitrate of soda, two-thirds should be given at the spring ploughing and one-third later in summer (February). Superphosphate usefully stimulates weed and cover crops for turning under and is best supplied at the rate of 2 cwt. per acre in the autumn. Lime again has no apparent direct benefit on citrus but often produces a marked response from the cover crops. The pronounced acidity of the local coastal soils is, however, probably increased by the organic and nitrogenous dressings applied and an application of 10 cwt. of carbonate of lime (agricultural) per acre every third or fourth year is recommended. In the case of magnesium-deficient soils dolomite instead of agricultural lime should be used. Inland soils do not require these dressings, though gypsum (calcium sulphate) markedly improves the texture of heavy clay loam.

* Mendel, K. The anatomy and histology of bud-union in *Citrus*. *Palestine J. Bot. hort. Sci.*, 1936, 1:2:13-46, being Bull. Rehovoth agric. Exp. Stat., **19**, 1936, *H.A.* 1937, 7:155.

1471. Bathurst, A. C. 634.3-1.8
New method for estimating the fertilizer requirements of citrus trees.
Fmg S. Afr., 1943, **18**: 323-7.
Estimation of fertilizer requirements for crops by field experiments are accurate but slow and costly, by soil analysis cheap but vague. A promising method, that of plant analysis, is discussed. Three Transvaal citrus orchards received identical quantities of sulphate of ammonia. A responded by greatly increased yield, B showed a depressed yield, C was unaffected. Leaf analysis showed that A was deficient in nitrogen at the time of application, B had a very high nitrogen content while C was comparatively normal. From this and other experiments carried out by the author it is concluded that leaf analysis provides a cheap and relatively easy way of estimating nutrient requirements for most of the important plant foods, a conclusion which is supported by results obtained in other countries, some of which are quoted. In citrus amounts of plant food vary from leaf to leaf in any particular tree, chiefly according to the age of the leaf. To secure uniformity leaves for analysis should be taken during June and July (in South Africa) from the stalk of the fruit and directly up against it. These leaves will be ten to eleven months old. The author asks for leaf samples from growers all over the Union. He feels that if the requirements of their orchards could be thus ascertained a considerable saving of fertilizer, important at the present time, could be effected.

1472. Chapman, H. D., Brown, S. M., and Liebig, G. F., Jr. 634.3-1.8
Some effects on citrus fruit quality of nitrogen, phosphorus and potassium.*
Calif. Citrogr., 1943, **28**: 198, 211, 230, 246, bibl. 18.
Citrus fruit quality was shown to be significantly affected by nitrogen, phosphorus and potassium in experiments carried out on trees grown out of doors in sand and solution cultures at the Citrus Experiment Station, Riverside. An increase of nitrogen above the optimum has no visible effect on the fruit, but nitrogen deficiency resulted in smoother skins and greater juice content. Such properties were found to be due to a higher phosphorus content, which accumulates under conditions of nitrogen deficiency. Smoother and juicier fruits were also produced when an increased amount of phosphorus was applied under conditions of nitrogen excess. In accordance with previous reports the authors conclude that phosphorus has a direct effect on the fruit. A further characteristic of the influence of phosphorus is a more solid, though not so highly coloured fruit. High potassium content makes for more acid fruits and, if excessively high, for very rough, coarse skins. Extreme deficiency of potassium brings about small fruits while moderately low potassium content has no effect on fruit quality. The results are regarded as preliminary until they have been correlated with field experiments already in progress.

* See also 1182 (ix).

1473. CHAPMAN, H. D. 634.3-1.874
Failure of vetch to excrete nitrogen from the nodules when grown in association with nitrogen-deficient citrus seedlings.
J. Amer. Soc. Agron., 1943, **35**: 635-7, bibl. 3.
Inoculated vetch seed was sown in pots containing nitrogen-starved citrus seedlings at the University of California Citrus Experiment Station, Riverside. Although the vetch grew well the citrus seedlings did not recover from their deficiency symptoms. The authors conclude that no significant excretion of root nodule nitrogen occurred.

1474. SOKOLOFF, V. P., AND KLOTZ, L. J. 634.3-2.19: 631.453
Decline and collapse of citrus trees in relation to nitrite in orchard soils.
Calif. Citrogr., 1943, **28**: 290-308, bibl. 1.
In a previous paper* the authors attribute a sudden decline and collapse of citrus trees to an excess of toxic nitrites in the soil. In the present paper the way in which these nitrites can be formed is explained. The production of nitrites may be brought about by incomplete bacterial oxidation of ammonia; causes of this may be an increase in acidity of the environment beyond a certain point by the introduction of soluble organic matter, by a restriction of moisture, or of aeration (e.g. by waterlogging) or by an elevated temperature. If the inhibiting factor happens to occur during the completion of the first stage of oxidation of ammonia, at which stage nitrite is formed, the second stage, nitrite to nitrate, may be delayed or inhibited and a more or less stable and significant quantity of nitrite be thus formed in the upper few inches of the soil, whence it will be washed down to the root zone. These transformations of nitrogen in the soil are contingent on the presence of relatively large quantities of the substances to be transformed, such as may be brought about by uneven distribution of nitrate fertilizer. It is also suggested that sulphate in combination with soluble organic matter will produce hydrogen sulphide which, like nitrite, is a respiratory poison. Two possible ways of minimizing the production of nitrite are the withholding of commercial nitrogen from the trees until the supply of soluble organic matter in the soil is at a minimum, especially during periods of excessive moisture, and a uniform distribution of small quantities of nitrogenous substances several times a year rather than a bulk distribution at one time.

1475. PARKER, E. R. 634.3-1.55
Adjustment of yields in an experiment with orange trees.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 23-33, bibl. 20, being *Pap. Calif. Citrus Exp. Stat.* **461**.
A study of the data of a fertilizer experiment laid out in an orchard of Washington Navel orange trees with a background of prior yields obtained during a 6-years' uniformity trial has led to the conclusion that in the 12 years of this experiment the interpretation of yield effects as influenced by fertilizer treatments, by means of covariance, could be most accurately made by using the concurrent yields of the check plots and the yields of the final uniformity trial year as independent variables. When this covariance was applied, a mean reduction in error variance amounting to about 46% resulted. This is equivalent to increasing the number of plots per treatment from 4 to a theoretical 7·4. [From author's summary.]

1476. BAJWA, B. S., AND RAM, A. 634.31-2.112
Sunburn of Malta and Sangtra oranges.
Ind. Fmg, 1943, **4**: 182-3.
Incidence and prevention of sunburn damage to Malta and Sangtra oranges were studied at Lyallpur for 3 years. Over 10% of the fruits were found to be suffering seriously from sunburn, the damage on the south-west side amounting to over 21%. The planting of rows of jantar (*Sesbania aegyptiaca*) on the south-west side at a distance of 7-8 feet from the trees provided shade and more than halved the proportion of affected fruits in Malta oranges and reduced it by two-thirds in Sangtra oranges. Jantar was sown in early spring, affording protection by the beginning of July, and was cut down in the middle of October. The plant is perennial and may be used in subsequent years. The authors recommend the growth of jantar wherever citrus plantations suffer from sunburn, the expense involved being negligible.

* *ibidem*, pp. 86-7; *H.A.*, 13: 551.

1477. PILLSBURY, A. F. 634.3-1.459
Erosion in orchards.
Calif. Citrogr., 1943, **28**: 228.
One of the chief causes of orchard erosion is an excessive furrow grade. Whenever the grade increases beyond 2-2½% steps ought to be taken to keep the damage moderate. Drops, even of a few inches, should be rounded off and sodded or overflow structures should be installed. Vigorous cover crops, though an effective protection against winter storm erosion, will allow irrigation waters to move the soil down the furrows in summer. Clean cultivated orchards are therefore advocated, the winter erosion of the latter being not so severe as the summer erosion of orchards with cover crops. Winter cultivation should be avoided.

1478. FLANDERS, S. 632.752 + 632.96
Mass production of the California red scale and its parasite *Comperiella bifasciata*.
J. econ. Ent., 1943, **36**: 233-5, bibl. 3.
The technique is described of producing red scale, *Aonidiella aurantii*, on *Cucurbita* sp. and its parasite *Comperiella bifasciata* on banana squash, at the University of California Citrus Experiment Station.

1479. CRESSMAN, A. W. 634.3-2.752
Effectiveness against the California red scale of cubé resins in light-medium and heavy spray oils.
J. agric. Res., 1943, **66**: 413-9, bibl. 7.
In spraying trials against California red scale of citrus, *Aonidiella aurantii*, the addition of cubé resins dissolved in an intermediary solvent of 1 volume of trichloroethylene and 2 volumes of dibutyl phthalate increased mortality from 55·4% and 76·3% for a light-medium and a heavy oil to 99·2% and 98·6% respectively in laboratory experiments and was similarly beneficial in field tests. The spray contained 1·5% oil and the cubé resins were used at the rate of 1 g. (22·3% rotenone) to 4 litres of spray.

1480. CRESSMAN, A. W. 634.3-2.752
Effectiveness against the California red scale of cubé resins and nicotine in petroleum spray oil.
J. agric. Res., 1943, **67**: 17-26, bibl. 10.
The effectiveness against the California red scale (*Aonidiella aurantii*) of heavy petroleum oil sprays applied by themselves and with additions of nicotine or cubé resins was tested by the Bureau of Entomology and Plant Quarantine, U.S. Department of Agriculture. Raising the oil concentration from 1% to 1·5% and 2% resulted in a considerable increase both of spray deposits and kills, the mortality on heavily infested grey lemon wood being 12·8%, 58·1% and 58·6% respectively. An addition of cubé resins to the 3 oil sprays increased the percentage of kills to 43·9%, 91·2% and 94·5% respectively. Cubé resins containing 22·3% of rotenone were diluted to 1: 5,000, in some experiments to 1: 4,000. Because of their limited solubility in petroleum oil they were dissolved in 1 part of trichloroethylene and 2 parts of dibutyl phthalate as intermediary solvent, which was added to the oil at the rate of 1: 10 before emulsification. Nicotine used in concentrations of 1: 2,000 and 1: 1,500 was less effective than cubé resins. Spray mortality was inversely related to density of infestation. Experiments on a large scale will be necessary to

decide whether the addition of a toxicant can be recommended from an economic point of view.

1481. LINDGREN, D. L., AND DICKSON, R. C. 634.3-2.752
Spray-fumigation experiments on California red scale.
J. econ. Ent., 1942, **35**: 827-9, bibl. 4.
The satisfactory control of California red scale, *Aonidiella aurantii*, by the use of a combination of oil spray and fumigation treatment is due to the additive effect of the two treatments and to the complementary nature of the kills resulting from the separate treatments. The second moult and early grey stages, which are most likely to survive fumigation, are killed by the oil spray, whereas the late grey and adult stages resistant to oil are disposed of by fumigation. Neither length of interval between spray and fumigation treatment nor order of application have any effect on results, but factors of climate and tree tolerance indicate that the spray should precede fumigation.

1482. LINDGREN, D. L., AND DICKSON, R. C. 634.3-2.944
Gas-tight tents in citrus fumigation.
Calif. Citrogr., 1943, **28**: 258, 278.
A new gastight fabric, Koroseal, has been tested at the Riverside Citrus Experiment Station, California, as a substitute for the permeable canvas tents used in citrus fumigation. It is constructed of aeroplane cloth, 78 threads per inch in warp and woof. The plastic coating impregnates the fabric and coats both sides. The weight is 9 oz. per sq. yd. A year's weathering of a small section failed to effect any deterioration. Tests with a 40 ft. tent were encouraging. The tent remained gastight after 2 winters' use, a saving of $\frac{1}{2}$ to $\frac{2}{3}$ the amount of HCN was affected and there was a more uniform kill of scale. There was no damage from mildew or weathering. Disadvantages are stiffness of material and higher cost. The use of gastight tents would mean a reinvestigation of exposures and dosages to determine the most practical and efficient combination to use.

1483. TURRELL, F. M., AND OTHERS. 634.3-2.951.22
Factors in injury to citrus by sulphur dusts.
Calif. Citrogr., 1943, **28**: 286-7, 302, 306, 310-1.
Laboratory experiments at Riverside Experiment Station, California, have shown that sulphur volatizes at 129° F. at the rate of 0·009 milligrams per hour. The sulphur dusted on citrus fruit volatizes during high temperatures and penetrates the rind in the gaseous phase. When gaseous sulphur enters the protoplasm (1) sulphur is reduced to H_2S gas and (2) sulphur is oxidized to sulphate. Production of H_2S gas per unit of time increases rapidly with the temperature from 90° F. to 120° F., and the total amount of H_2S formed increases with temperature up to 115° F., then decreases with additional increases in temperature. H_2S gas will penetrate the rind, producing typical sulphur injury, though whether as the causal agent or as a by-product indicative of an injurious preliminary reaction is at present uncertain. One of the principal environmental factors influencing sulphur burn is the intensity of sun radiation received and undissipated by citrus fruit by reradiation or by conduction. High relative humidity, warm air and lack of air movement are secondary but important factors.

1484. STOFBERG, F. J., AND LE ROUX, J. C. 634.3-2.651.3
Citrus nematode investigations.
Citrus Gr, 1943, No. 112, pp. 9-11, bibl. 10.
For abstract of same article in *Fmg S. Afr.* see *H.A.*, 13: 980.

1485. FEDCHENKO, B. A. 634.1/8
The bulletin of dry sub-tropical crops. Published by the Federal Research Institute of dry sub-tropics, Stalinabad (Tadžikston). [Russian.]
Sovetsk. Botan., 1941, No. 5-6, pp. 104-5.
This is a general review dealing with the activities of the Research Institute—founded in 1934—as reflected in the Bulletin, 58 issues of which had appeared at the time of this review. The Institute has 8 sub-stations with a staff of 40 scientific workers, who in recent years have studied the following problems: 1. Local sub-tropical fruit. 2. Introduced sub-tropical fruit. 3. The cultivation of officinal plants and herbs. 4. Vegetable growing in the open. 5. Problems of irrigation. 6. Fertilizers and manures. 7. Selection. In Russian Central Asia the growing of lemons on a commercial scale is likely to be developed. Articles are included dealing with the cultivation and standardization of walnuts, figs, pomegranates, almonds, kaki, guayule and *Cassia* sp. It would appear that there are brilliant prospects for growing sugarcane commercially.

1486. WALTER, H. 63(688)
Die Farmwirtschaft in Deutsch-Südwestafrika. Ihre biologischen Grundlagen. III. Ackerbau und Obstkultur. **(Farming in South West Africa. III. Agriculture and fruit growing.)*** [English, French, Italian summaries.]
Deutsche Forscherarbeit in Kolonie und Ausland, Heft 3, Paul Parey, Berlin, 1940, pp. 150, bibl. 26, RM. 4.50.
Only subjects with a bearing on horticulture can be dealt with. After discussing the principles of dry farming in South-West Africa the author expresses himself against the growing of castor oil plants, but advocates the cultivation of peanuts (*Arachis hypogaea*) and of olives, almonds, figs and grapes on dry, non-irrigated soils. On the analogy of the cultivation methods of olives, figs and almonds adopted under dry conditions in Libya it is emphasized that (1) the planting distance must be very great (24×24 m. for olives), (2) the soil must be kept friable and completely clean. (3) young trees must be watered for the first 5 years after planting until their root systems are sufficiently developed, Older olive plantations should yield 5 tons per hectare, even where the rainfall does not rise above 250 mm. a year. Vineyards could be made to yield 20-30 cwt. of grapes especially for raisin production, if the wood is kept very low and the vines are planted at distances of 2×2 m. or 3×2½ m. In the second chapter general problems of irrigation and of a brackish soil are dealt with at length. The author favours furrow irrigation as the best method for local conditions. Fruit trees and vegetables are classified in a table according to their resistance to brackish soil, as follows:—slightly susceptible—dates, vine, olive, turnips, onions, celery, black radish; susceptible—orange, almond, fig, pear, apple, potato, carrot, artichoke; very susceptible—peach, plum, apricot, lemon, mulberry. Practically all European vegetables can be grown in South-West Africa, their chief enemy being nematodes. There are few small fruits, but the Cape gooseberry, *Physalis peruviana*, and the berries of the black nightshade, *Solanum nigrum*, are popular. The latter are not poisonous, if picked ripe. Of the various methods of orchard irrigation described, that through furrows from a distributor pipe or trench is the one most commonly used. The usual inclination of a furrow, which should not be longer than 180 m. in sandy soil or 200 m. in clay soil, is 1:400 to 1:300. The trees are planted at distances of 5×5 to 10×10 m. Furrows must not be drawn too close to the trees and water supply must not be so plentiful as not to force the roots to penetrate into the deeper layers. Winter is the best time for irrigation where this season is dry. The soil should be moist when the buds break. After the conclusion of the main growth period water should be supplied moderately. Much the same rules apply to the

* Previously noted, *H.A.*, 13: 704.

irrigation of vineyards. The best method of pruning vines in South-West Africa has still to be found. So far, fruit and grape cultivation in this area have been insignificant owing to South African competition. The author believes however, that fruit and grape growing might be of great future importance if a European market could be secured. The export of dried fruit and raisins may also play a prominent part at some future date. So may dates, which could be exported to South Africa. The Swakop valley and the inner Namib are thought to be particularly suitable for the cultivation of this fruit, and directions for this are given. The cultivation of *Citrus* and of certain sub-tropical fruits for home use is briefly dealt with. Finally, plans for erecting dams for irrigation are discussed and a list of indigenous economic and medicinal plants is given.

1487. DICKEY, R. D. 633.85-1.531
The importance of tung seed selection.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 127-30, bibl. 4.

The seed progeny of two high-yielding, open-pollinated tung trees, No. 2 and No. 9, at Gainesville Experiment Station, Florida, showed a considerably higher percentage of high yielding trees than trees grown from unselected seed. In respect of resemblance to parent 69·2% of No. 2 and 74·8% of No. 9 seedlings came fairly true to type, the great majority resembling their parents in all five characters used.

1488. ANGELO, E., BROWN, R. T., AND AMMEN, H. J. 633.85: 581.162.3
Pollination studies with tung trees.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 176-80, bibl. 1.

Experiments in pollination with tung, *Aleurites fordii*, in Florida showed that, while wind may be some aid in distribution, the very complete fruit set usually exhibited by tung is almost entirely the work of insects, principally bees. There is a gradual decline in the efficiency of pollen from the first day after anthesis. The best set of nuts was obtained with pollen from flowers that had been open one day and pollen of this age is recommended for controlled crosses.

1489. SCHULTZ, E. F. 633.85-1.45
El cultivo de las plantas intercalables entre los árboles de tung. **(Cover cropping under tung.)**
Rev. industr. agric. Tucumán, 1942, **32**: 339.

Since tung is harvested by the collection of fallen nuts the choice of an anti-erosion crop is limited. In Argentina cowpea should be sown in October to be ploughed in in March, the tung is harvested from April to June, and from July a grain crop can be sown. Velvet beans are a useful crop during the early years before the trees have borne their first fruit.

1490. MERRILL, S., Jr., KILBY, W. W., AND GREER, S. R. 633.85-1.8
Fertilization of tung seedlings in the nursery.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 167-70.

At the Experimental Tung Field Station, Poplarville, Mississippi, an application of 200 lb. per acre of 8-8-6 mixed fertilizer applied either in the row at planting or as a side dressing, gave as good results in the tung nursery as a heavier dressing. 650 lb. per acre of tung meal or cotton-seed meal applied alone or 200 lb. per acre of the same added to the 8-8-6 fertilizer were in the main ineffective, a slight improvement of growth on the cottonseed only plots having no practical significance.

1491. FERNHOLZ, D. L. 633.85-2.111
Cold resistance of buds, flowers and young fruits of tung.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 124-6.

Tung buds become increasingly susceptible to injury from low temperature as they pass from the dormant to the light and open cluster stages. At and after the light cluster stage exposure to 26° F. will destroy most of the buds. The tender pedicels and peduncles will be destroyed at 28° F. just after emergence, but they become more resistant later. Before anthesis a temperature of 30° F. did not injure the buds and they later developed faster than the unfrozen controls. Very young fruits are more susceptible to injury than are flowers at anthesis.

1492. DICKEY, R. D., AND DROSDOFF, M. 633.85-2.19: 546.711
Control of manganese deficiency in a commercial tung orchard.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 74-8, bibl. 5.

Results from Florida trials in 1941 and 1942 indicate that 2 pounds of 65% manganese sulphate is a satisfactory soil application to correct several manganese deficiencies in mature tung trees on Arredonda loamy, fine sand soil. The addition of ammonium sulphate alone or in combination with the manganese sulphate also proves beneficial.

1493. DROSDOFF, M., AND PAINTER, J. H. 633.85-2.19: 631.83
A chlorosis and necrosis of tung leaves associated with low potassium content.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 45-51, bibl. 16.

Interveinal chlorosis and necrosis of tung leaves is shown to be associated with low potassium content. The leaves at the base of the terminal shoot are first affected, the symptoms advancing later towards the apex. Yellow areas appear at the leaf margin between the veins and extend inward in irregular patches. Necrotic patches and leaf margins are frequent, these symptoms being an advanced stage, though they may develop without preliminary chlorosis. A mulch of 35 lb. fresh weight per tree of crotalaria and native grasses increased potassium content of the trees and the mulched trees showed little chlorosis, whereas clean weeded trees in the alternate rows were badly affected in orchards in Florida.

1494. DROSDOFF, M., AND DICKEY, R. D. 633.85-2.19: 546.56
Copper deficiency of tung trees.
Proc. Amer. Soc. hort. Sci. for 1943, 1943, **42**: 79-84, bibl. 5.

Observations at Gainesville, Fla and Alachua, Fla disclose that a cupping and chlorosis of leaves and defoliation of shoots in tung is due to copper deficiency. Spraying with copper sulphate solution or application of ½ oz. copper sulphate in solution to the soil at the base of 1-year-old trees resulted in recovery and usual growth.

1495. ALDRICH, W. W., AND OTHERS. 634.62: 581.144.4
Some factors affecting rate of date leaf elongation.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 77-84, bibl. 9.

The method of measuring leaf elongation of date palm by means of a flexible wire attached to the rachis and extending down the trunk is described from California. The rate of elongation was found to vary from period to period (a table showing rates and calendar dates is given), slowing down to below that of the younger leaves in 51-62 days and ceasing 50-60 days later. Soil temperature may be an important factor in rate of leaf elongation. Growth could be limited temporarily both by soil moisture deficiency and by water deficits within the palm itself during periods of high transpiration when it could be shown that soil moisture was not the limiting factor. High relative humidity seemed to increase the rate of leaf elongation. The removal of half the leaf area (and half the fruit crop to maintain the leaf/bunch ratio) resulted in a 13% higher rate of leaf elongation compared to that in untouched palms. In commerce only 20% to 25% of the leaf area is removed and this should not

materially affect elongation. In commerce 6 to 10 leaves are left for each moderately thinned bunch. Leaf elongation with only 3 leaves per bunch was from 15% to 21% less than with 7·5, 10 or 15 leaves per bunch with odds for significance greater than 99: 1.

1496. NIXON, R. W. 634.62-2.19: 631.542.27
Fruit shrivel of the Halawy date in relation to amount and method of bunch thinning.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 85-92, bibl. 3.

In experiments of different methods of bunch thinning of dates (32 replications) in California cutting out the central strands very slightly increased fruit shrivel, but a highly significant increase occurred (especially on the dry plots without irrigation from mid-July to mid-September) when an equivalent amount of thinning was performed by cutting back all strands. Extreme cutting back, amounting to a total reduction of 90%, caused all remaining fruits to shrivel. Most shrivelling occurred on the periphery of the bunch where exposure to sun and air movement were greatest.

1497. KECK, C. B. 634.651-2.77
Infestation of mature green papayas by the Mediterranean fruit fly.
J. econ. Ent., 1942, **35**: 802-5, bibl. 1.

The Mediterranean fruit fly, *Ceratitis capitata*, is stated by growers in Hawaii to attack, not mature, but unripe papayas, though the ripe fruit is an excellent host. Investigations to settle this point indicated that papayas at this stage are attacked sufficiently often to render it probable that the transport of untreated mature green papayas to U.S.A. would result in a transportation also of the fruit fly larvae. It was found that a papaya grove is not a suitable place for flies to congregate, particularly if it is clean weeded, with the trees spaced at least 12 feet apart and kept free from ripe fruit.

1498. SCHROEDER, C. A. 634.653: 581.162.3
Pollen germination in the avocado.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 181-2, bibl. 3.

Avocado pollen failed on all occasions to germinate on sugar though it would germinate at temperatures of 40° F. and upwards on stigmas not only of avocado but of a number of unrelated species as well. Stored avocado pollen retains viability for several weeks.

1499. HOPKINS, J. C. F. 632.3/4+632.8
A descriptive list of plant diseases in Southern Rhodesia (and their control). Supplement 1. January, 1940, to April, 1943.
Rhod. agric. J., 1943, **40**: 178-92.

The present list is a supplement to that published in December 1939 as *Memoir No. 2 of the Rhodesia Department of Agriculture* [*H.A.*, 10: 651]. It contains all new records to date including a good number of viruses and several correctious and emendations.

1500. COCHRAN, H. L. 633.492: 577.16
The carotene content of sweet potatoes.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 259-64, bibl. 16.

TROPICAL CROPS.

1501. MOORE, R. E. 551.566.1: 63
Tingo María.
Agric. Amer., 1943, **3**: 107-8.

ANON.
An agricultural experiment station.
Chron. Bot., 1942, **7**: 228.

An account is given of the arrangements between the Governments of Peru and U.S.A. for the establishment of a co-operative agricultural experiment station at Tingo María, Peru, at 2,200 feet above sea level, in the first article. The names are given of those members of scientific staff who are to be provided by the U.S.A. Experimental work has already been initiated, though the building programme is only just starting. Similar stations have been started in four other American Republics.

1502. BARRIENTOS, L. 551.566.1: 633/635
San Andrés.
Agric. Amer., 1943, **3**: 150-1.

The site of the Centro National de Agronomía of El Salvador is in the San Andrés Valley and here, with the help and advice of the U.S. Department of Agriculture, a research station is being established. Among projects already initiated are the cultivation of derris, cinchona and rubber (*Hevea*). Plans are also being made to study plant sources of edible oil, fibre plants, coffee cultivation and other plants of economic value.

1503. THOMAS, A. S. 633/635(676.1)
Food crops as indicator plants in Uganda.
E. Afr. agric. J., 1943, **8**: 136-40, bibl. 6.

Banana planted areas in E. Africa are indicative of fairly rich and deep soils. Examples of this are supplied by the vegetation pattern of various districts. Not only the distribution of the gardens but the vigour and height of the trees are also useful indicators of grades of soil fertility. The kind of banana should be noted, for the true banana, *Musa sapientum*, will flourish on poorer soils than will the plantain, *M. paradisiaca*. Finger millet, *Eleusina coracana*, a staple food of tribes living in acid areas, can be grown on good soils without much burning or cultivation, but on poor soil the tufts of grass are hoed up and burnt to provide ashes for spreading on the ground. Maize requires a rich soil and sorghum, *Sorghum vulgare*, one that is less so. The semi-parasitic witch weeds, *Striga* spp., attack the millets and maize on soils of low fertility, especially on land depleted by successive crops of cereals. It can be controlled, it is said, by heavy manuring. Sweet potatoes, *Ipomoea batatas*, are planted on wet soils too poor for bananas. Other crops which can be and are sometimes grown on the poorer soils are *Coleus dysentericus* and *C. dazo* and the Bambara groundnut, *Voandzeia subterranea*. Intertwined with these facts are interesting speculations on the place of origin of the various African food crops, for instance, there are over 50 varieties of banana in Uganda of which between 30 and 40 were grown there before the advent of Europeans. None has ever been known to seed, and bud mutation, though possible, is uncommon. Where did they come from and who brought them? The only possible route appears to have been from the south. The article concludes with a discussion of the influence on the diet and habits of African peoples of crop introduction and of the cultivation systems which hold out most promise for the future.

1504. MASEFIELD, G. B. 631.459
Experience with grass stop-wash lines in Uganda.
E. Afr. agric. J., 1943, **8**: 219-22, summarized by W.W.M. in *Plant. Chron.*, 1943, **38**: 292.

A series of trenches 3 in. deep are dug along the contours (which need not be exactly measured) spaced about 20 yards apart. Fresh stems of elephant grass (napier grass, *Pennisetum purpureum*) are laid along the trench side by side in pairs or threes, the ends overlapping, and covered with an inch or two of earth. Planting cuttings stuck upright in the soil is only effective in very wet weather but is useful for filling gaps. Further treatment of the line by periodical cutting back to ground level will depend on growth. At longer intervals it may be necessary to curtail the encroachment of the stools on the cultivated ground. Loppings are used at first to assist the soil catching power of the line by

laying them at the foot of the line on the upper side but when the plants are well established the loppings can be used for mulching, composting or cattle feed or bedding. There is some discussion of the edge effect (i.e. of root competition) with the adjoining crops. Crops vary in susceptibility according to variety but the value of the mulch and the saving of soil is likely to offset substantially any slight yield reduction in the immediate neighbourhood of the line.

1505. OLIPHANT, J. N. 676.2
Paper and cellulose possibilities in West Africa.
Farm and Forest, 1943, **4**: 39-41.

The possibilities of certain West African grasses as a source of material for the local manufacture of paper and cellulose are discussed. The grasses in question are elephant grass (*Pennisetum purpureum*) from southern and gamba grass (*Andropogon gayanus*) from northern Nigeria, both of which secured fairly favourable opinions on examination by the Imperial Institute, and *Vossia cuspidata*, a semi-aquatic grass of Lagos and of the sudd of the Upper Nile. This has not been tested. It might be harvested by detaching islands by means of an underwater saw and towing them to a factory.

1506. BALL, R. S. 632.951
Pyrethrum cultivation in Kenya.
Trop. Agriculture, Trin., 1943, **20**: 158-61, abridged from *Nyasaland agric. quart. J.*, 1943, Vol. 3, No. 1.

A full account of methods successfully employed in Kenya in the cultivation of pyrethrum.

1507. (MAURITIUS DEPARTMENT OF AGRICULTURE.) 632.64
Notes sur la préparation et le mode d'emploi d'un appât empoisonné contre les colimaçons. **(Preparing a poison bait for snails.)**
Rev. agric. Maurice, 1942, **21**: 271.

The formula consists of metaldehyde (Meta) 12 g., ground maize 500 g. The Meta is powdered and mixed with the flour by sieving. By addition of water a thick paste is made and this is compressed by hand into balls the size of a small lime, about 60 to the pound. These are distributed throughout the field at intervals of 10 to 15 feet. It is advisable to protect from rain by means of a split bamboo. If the bait dries hard in the field it can be collected and reconditioned by moistening with warm water. Dead snails should be collected daily to allow free access to their successors.

1508. PONCE DE LEÓN, E., AND CAMACHO, R. R. 633.525.1
Nuevas fibras para nuestra economía. **(New fibre plants for Colombia.)**
Agricultura Colombia, 1942, **14**: 1132-43.

An account of the cultivation of ramie (*Boehmeria nivea*) and jute as it can best be carried out in Colombia. In the warmer parts of Colombia both ramie and jute grow extremely well, though so far they have attracted little interest.

1509. FOSTER, R. G. 633.68
[Food value of jack fruit seeds.]
Plant. Chron., 1943, **38**: 268.

A valuable food is going to waste in the nuts or seeds of the jack fruit. Indian coolies eat them roasted and boiled. If kiln dried and ground they should produce a flour of some value. A recent analysis gives their composition as follows: Moisture 52·10%, protein 4·62%, carbohydrate 41·20%, ether extract (fat) 0·66%, fibre 0·16%, mineral matter 1·26%, calorific value per 100 g. 189·2, or a composition similar to that of rice. The roast seeds have a flavour of chestnut.

1510. HADLEY, J. M. 633.681
St. Vincent: its Carib legacy of arrowroot.
Crown Colon., 1943, **13**: 691-2.

The article contains an account of arrowroot production in St. Vincent, B.W.I. The island produces practically all the arrowroot required for the world's markets. The root when dug is 6 in. to 8 in. long and 3 in. to 3½ in. in diameter, jointed like a bamboo, waxen in colour and smooth between the joints. Digging is performed by gangs of men, progressing in line across the field. As each root is lifted the "head" or proximal end is broken off and replanted, the withered leaves and trash being dug into the soil at the same time. The harvested roots placed in small heaps are collected by women with baskets and removed to the factory. Payment is by basket and each man fills five baskets a day. At the factory the roots are washed in a revolving drum and water borne in concrete gutters to the grinder. Here the roots are ground fine and the resulting powder is conveyed to a large sink where water plays on it till the starch is washed out. The starch water is passed through fine sieves into two further sinks, the sieved debris being collected for cattle food. From the third sink the water is run into a long concrete trough (illustrated) and allowed to settle, after which the water is drained off. The starch in the form of grey paste is dug out, washed again and resettled in vats (illustrated), to be later dug out and carried on large wooden trays to the drying house where it is spread on racks of wire net and air-dried. The dried starch, now quite white, falls through the racks into wooden troughs whence it is tightly rammed into sacks with a wooden pestle and taken to the arrowroot pool for grading and barrelling for export.*

1511. (EDEN, T.) 633.72-1.542+1.55
Tipping and plucking [tea].
Plant. Chron., 1943, **38**: 96-7 reprinted from *Tea and Rubb. Mail, Ceylon*, Nov. 5, 1942, and *A.R. Tea Res. Inst., Ceylon*, 1941 (being *Bull.* **23**), pp. 56-7.

An account of a tea plucking experiment carried out at the Tea Research Institute, Ceylon, to compare effect on yield of the Ceylon and N.E. Indian methods of plucking. After a year's plucking the results in pounds per acre were as follows. Normal tipping at 4 in. 677, direct plucking at 6 in. above pruning cut 770; plucked over single leaf 634, plucked to fish leaf 813; banjhi† removed 813, banjhi left 634. Evidently marked differences in yield are being caused by the treatments, but the testing time will be later in the cycle. Commenting on the above Jhannum in a letter (*Plant. Chron.*, 38: 96) remarks that pruning methods in North India differ from those in South India, especially in their harder plucking. For South India with old tea in poorish soil, exposure to wind, rain and helopeltis attack plucking to one leaf above the fish gives the best results if the future health of the tea plant is considered. The writer would like to see the Ceylon experimental plots in five years' time.

1512. TEA RESEARCH INSTITUTE EXPERIMENTAL SUB-COMMITTEE. 633.72-1.542
Maximum production of tea and length of pruning cycles during emergency conditions.
Tea Quart., 1943, **16**: 21.

There has been a tendency to lengthen the pruning cycles in mid and up country tea districts in Ceylon by 6 or 12 months. This has led to no reduction in monthly yields for the extended period but a considerable increase of labour has been needed to pluck such areas. Factors involved, such as high rates of pay and the attitude of the pluckers to difficult fields are discussed. It is finally concluded that to produce a maximum crop with a limited labour force a reduction in the length of the pruning cycle on many tea estates is necessary.

* For a slightly fuller account of arrowroot cultivation in St. Vincent, see "Vegetative propagation of tropical and subtropical plantation crops", *Tech. Commun. Bur. Hort.* 13, 1940, pp. 99, 3s. 6d.

† dormant side shoots.

1513. Bond, T. E. T. 633.72-2.19
Deficiency diseases and the role of minor elements in plant life.
Tea Quart., 1943, **16**: 9-15, bibl. 13.

A short general account showing the importance of the minor elements in plant nutrition with some examples from tea. In Ceylon minor element deficiencies in tea cultivation are not apparent, the one time suggestion that phloem necrosis might arise from boron deficiency having been disproved. In Nyasaland tea yellows is cured by the application of fertilizers containing sulphates or by the direct application of sulphur at the rate of 24 lb. per acre. In Java work on potash deficiency of tea soils led to the study of certain minor element deficiencies.* Deficieney symptoms of tea in sand cultures are described for calcium, magnesium and sulphur.

1514. Gadd, C. H. 633.72-2.76
Shot-hole borer [*Xyleborus fornicatus*] and wood rot.
Tea Quart., 1943, **16**: 6-9, bibl. 3.

Further work on the problem of whether shot hole borer attack in Ceylon results in an increase of wood rot in tea after the plant is pruned shows that there is roughly twice as much wood rot in borer-infested branches as in non-infested. Although this experiment disclosed no reason for this increase, from results obtained in previous work† it seems improbable that the wood-rotting fungi normally gain entrance into the stem through shot hole borer galleries. Possibly the wood around the galleries is rendered more susceptible to attack or can be reduced to a friable condition more quickly by wood-rotting fungi after entry.

1515. Pais, S. 633.73
Estate farming in India. IX. Merthy Cowanhalla Estate.
Ind. Fmg, 1943, **4**: 77-80.

The author tells the history of his coffee estates at Chikmagalur, Mysore State, through 3 generations. Warning against some common errors, he reports in conclusion that it took him 5 years to make his farm recover from a setback received by overcropping during a boom period.

1516. Jaramillo, J. H. 633.73
El cafe en Venezuela. **(Coffee in Venezuela.)**
Agric. Venezolano, 1943, **7**: 83-4: 20-3, 26-31, 33-7, bibl. 16.

A full account of Arabian coffee cultivation in Venezuela, including a brief review of the somewhat primitive methods employed until recently. In Venezuela coffee must be grown under shade. The reasons for this are mentioned. Shade trees should be quick growing, of open habit, long-lived, evergreen, deep rooting and disease resistant. Such trees are to be found in the genera *Inga*, *Albizzia*, *Cassia* and *Erythrina*. Propagation is by seed selected from the middle sections of the older primary branches of the younger trees. It is cleaned of the pulp, sterilized in hot water and sown in raised beds, with a covering of sand. Germination requires 50 days and after the formation of the first pair of leaves the seedlings are transplanted to nursery beds under artificial shade, where they remain for a year, at the end of which period they should be 50 cm. high and have 2 to 3 pairs of primary branches. The final shift to the permanent site is carried out during the rains, the planting distance recommended being 3 metres. The plants receive the customary cultivations, chiefly to control weeds. Notes are given on 8 different pruning systems. The one approved by the author for Venezuela is known as "free growth". It consists in growing on a single stem a selection of the most vigorous and best placed shoots, and eliminating the rest, and has the merits of economy of labour, of maintaining the natural habit of the plant and of causing little check. Twenty-four diseases and pests receive brief mention, some being illustrated. The wet and dry methods of extracting and curing the bean are described. The work of the National Coffee Institute, the Coffee Advisory Board, Experiment and Plant Distribution Stations, Instructional Centres for Growers and of the local Advisory Committees is touched on and provides evidence of the determination of the Venezuelans to do all that is possible to maintain and increase the reputation, already high, of their principal crop.

* Fully described and illustrated in colour by de Haan, I. Gebrekverschijnselen bij thee veroorzaakt door een tekort aan de belangrijkste minerale voedingsstoffen met uitzondering van kalium. (Deficiency symptoms on tea other than potassium.) *Arch. Theecult. Ned. Ind.*, 1941, 15: 1-24. [English summary.] (*H.A.*, 11: 1377.)

† For earlier work, see *Bull. Tea Res. Inst. Ceylon* 13, being *A.R. for year 1935*, pp. 36-7.

1517. Morgenroth, E. 633.73
Die Kaffeekultur im Staat Sao Paulo, Brasilien. **(Cultivation of coffee in the State of Sao Paulo, Brazil.)**
Deutsche Forscherarbeit in Kolonie und Ausland, Heft 8, Paul Parey, Berlin, 1942, pp. 32, bibl. 10, RM. 1.40.

After briefly surveying the history of coffee cultivation in Brazil and indicating that country's share in the world production of coffee (62·3% in the period 1931-9) the author gives interesting data on coffee growing in the State of Sao Paulo, where about 70% of Brazil's coffee is produced. The drastic change from a rainfall of about 230 mm. a month during the rainy season to about 46 mm. during the dry season causes a marked interruption between the periods of vegetative and fruit growth. The average temperature during the hottest months is about 23° C. as against 14-16° C. during June and July. Coffee is very susceptible to frost. A red, almost violet clay mixed with fine sand, the so-called "terra roxa" is regarded as the most desirable soil. *Gallesia gorarema* and some other trees serve as index trees for the selection of new plantation grounds. A pH of 4-5 is supposed to be the most favourable soil reaction. Café commun, also called Café national, is the variety of *Coffea arabica* most frequently grown, but Café bourbon is grown also because of its better flavour. Among the local varieties Café amarella, with a particularly high caffein content and yellow fruits, seems to be gaining in importance. Flowering depends on rain. If at the end of the dry season coffee plants are watered before the rains set in, they will start flowering within 10 days. When the first rains are insufficient, flowering goes on for some time, resulting in delayed maturity in part of the crop and poorer quality of the coffee, since all the fruits are harvested at the same time. After 10-15 years a plantation will have reached its climax, but plantations on fertile soil may still give almost maximum yield after 80 years, if manure is generously applied. The average yield of a tree is 400-1,000 g. marketable coffee a year, while well kept trees are said to yield up to 2·5 kg. Most of the coffee is produced on large farms of 400,000-800,000 trees. The biggest plantation of 3,000,000 trees is owned by an English company. In 1938, of 100 sacks of coffee sold to the State agent 40 were marketed, 30 stored and 30 burned. There was a strong tendency to reduce coffee production in favour of cotton grown in rotation with other crops. The latter were chiefly used for feeding the cattle kept to provide manure for the coffee plantations. Cultivation and harvesting of coffee as well as a borer pest (*Stephanoderes hampei*) and its parasite (*Prorops nasuta*) are described and tribute is paid to the coffee research work of the Instituto Agronomico at Campinas, where the author studied the problems discussed in 1938-9.

1518. Lane, R. V. 633.73-1.542
Practical notes on converting to multiple stem.
Mon. Bull. Coffee Bd, Kenya, 1943, **8**: 63, 60.

Since multiple stem coffee trees have resisted the outbreak of thrips better than single stem trees, the conversion to multiple stem is advocated by the author who has carried

out this operation on his own farm with good results. The multiple stem has the advantage of freer circulation of air, natural control of crop and a freer sap flow. Pruning of the single stem tree produces notches on the primaries which tend to prevent free sap flow. The technique of conversion by cutting away one side of the tree and leaving 3 suckers is described in detail. A note by the Coffee Services (p. 60) endorses the author's views after experimentation on the same lines. Commenting on the above (p. 60) the Editor remarks that the physical condition of the tree is of importance in deciding the time of conversion. The trees should be classified into two groups, (*a*) those that have lost their crop but have maintained their foliage, (*b*) those that have lost their crop and become completely defoliated. In the case of (*a*) more suckers should be allowed to grow than will be ultimately required, since all may not develop healthily. Final selection can be made when they are 1 ft. high. With (*b*) group it is important that the trees should be allowed to recover before any cutting takes place. Too early cutting of these trees will merely produce a lot of useless suckers.

1519. RAYNER, R. W. 633.73-2.3/4
Extracts from the annual report for 1942 of the plant pathologist (Coffee Services).
Mon. Bull. Coffee Bd, Kenya, 1943, **8**: 51-2, 61-2, 64.

The damage caused by *Antestia lineaticollis* to coffee trees was found to be quite distinct from black bean; when bacteria were introduced, however, the symptoms became almost indistinguishable. Investigating the causes of shedding of young cherries in the Makuyu district the author demonstrated by ringing trees that cutting down the supply of reserve materials to young fruits is responsible for the berry fall. Under outdoor conditions it is probably the competition of the larger fruits which reduces the amount of reserve materials available to the younger ones. This would be the case particularly in the Makuyu area which is typified by the size of its short rains flowering. Ringing and defoliation experiments showed that black bean is a deficiency disease. Black or light beans are produced by lack of reserve material occurring at a time when the berries are more or less fully grown, but still young, namely in an intermediate stage between very young, when deficiency causes shedding, and the later stage, when deficiency results in buni or die-back. Green bean also was found to be associated with nutritional disturbances. It occurred on overbearing bushes and bushes with an excessive vegetative growth. Beans from cherries picked immature are another cause of this trouble in fermented and washed parchment coffee. Measurements showed that the average growth of the trees during the year recorded may be divided into 6 periods: (1) the short rains in November and December, rather low; (2) January, growth increased with sunshine, but fell later as the soil dried out; (3) February, highest value after 2 rainstorms but fell again as the soil dried out; (4) March-mid-April, long rains; variations in hours of sunshine seemed correlated with variations in growth; (5) growth declined until it reached a very low level in July, probably produced by a reduction of hours of sunshine and by the crop on the trees; (6) growth rose somewhat as the hours of sunshine increased, watering having a marked effect. The trees flowered about 9 times, but the flowering at the end of February far exceeded the others. Flowerings correspond markedly to previous periods of rain. On the average flowers appear about 14 days after the rain that produces them. Observations on "weak spots" and on the differentiation of the flower bud are still in progress. The experiments were carried out at the Scott Laboratories.

1520. ANON. 633.73-1.56
Maintenance of coffee pulpers.
Plant. Chron., 1942, **37**: 518-9.

Notes on the maintenance of coffee pulpers under wartime conditions are quoted from the *British Trade Journal* (undated). Particular attention is given to such light repairs as can be undertaken by planters not possessing a fully equipped workshop.

1521. ANON. 633.73: 633.88.51
Coffee cherry husk and malaria.
Plant. Chron., 1943, **38**: 186-7.

The popular belief in parts of India that an infusion of the husk or cherry of coffee is a good substitute for quinine in the treatment of malaria is shown to be without foundation. Experiments leading to these conclusions were carried out at the School of Tropical Medicine, Calcutta, and the Malaria Institute of India, Delhi.

1522. POSNETTE, A. F. 633.74-1.521
Cacao selection on the Gold Coast.
Trop. Agriculture, Trin., 1943, **20**: 149-55, bibl. 16.

An account is given of the cacao available for selection work on the Gold Coast, of the selection methods used, of the results of selection by the Agricultural Department with both Amelonado and Trinitario types and of the progeny trials now in progress. Genetical variation in Amelonado cacao appears mainly in number of pods per tree.

1523. POUND, F. J. 633.74-1.541 + 1.535
The significance of budding and grafting cacao and of producing rooted cuttings.
Proc. agric. Soc. Trin. Tob., 1943, **43**: 65-74.

The technique and significance of vegetative reproduction of cacao are explained for the benefit of growers, the methods dealt with being budding, grafting, marcotting and the rooting of cuttings. The question of rootstock effect is briefly mentioned. In the end a series of clonal rootstocks may be evolved each adapted to a particular locality and/or to a particular scion variety. Instancing the value of a dwarfing stock it is suggested that since a cacao tree today may occupy a ground space of 150-250 square feet and produce from 70 to 150 pods yearly at its best, with a dwarfing stock, which would form a tree occupying only 10 square feet, each tree need only produce 5 pods per annum to exceed the yield mentioned above, and spraying, pruning and picking as well as rehabilitation would be very much easier and cheaper.

1524. POSNETTE, A. F. 633.74-2.8
The diagnosis of swollen-shoot disease of cacao.
Farm and Forest, 1943, **4**: 67-70, bibl. 4.

The symptoms of the swollen shoot disease of cacao, as they occur on the Gold Coast, are described. In the variations of symptoms due to a corresponding variation of the virus and in the symptoms themselves the author sees a remarkable parallel with the peach mosaic complex in North America.

1525. POSNETTE, A. F. 633.74-2.8
Control measures against swollen shoot virus disease of cacao.
Trop. Agriculture, Trin., 1943, **20**: 116-23, bibl. 8.

The control of swollen shoot disease of cacao in West Africa can only be achieved by elimination of the trees carrying the virus, since the control of the several insect vectors is impracticable. The fringes of the known infected areas are surveyed and as isolated outbreaks are discovered they are treated by cutting down and stumping infected trees together with a ring of apparently healthy trees, compensation being paid for the latter only. The paper relates the history of control measures on the Cocoa Research Station at Tafo, which in spite of increased frequency of outbreaks, largely from outside infection, have reduced the annual loss of trees in 1942 to a third of that in 1940. Six methods of treating outbreaks are described. None was completely successful and the most that can be expected of that finally adopted is that it will delay the spread of the disease sufficiently to enable replanting with a resistant variety to keep pace with the destruction.

1526. BAKER, R. E. D. 633.74-2.4
Witches' broom disease investigations. IV. Further notes on the susceptibility of I.C. selections at River Estate to witches' broom disease of cacao.
Trop. Agriculture, Trin., 1943, **20**: 156-8.
Five of the 100 selected clones under trial show signs of a less than average susceptibility to witches' broom disease, being also self-compatible and good in respect of yield and quality of produce.

1527. POUND, F. J. 633.74-1.521.6
The quest for witches'-broom resistant trees.
Proc. agric. Soc. Trin. Tob, 1943, **43**: 55-63.
On his travels in the Amazon valley in search for cacao trees resistant to witches' broom the author found a group of trees which had been disease free or almost so since 1938. The trees belong to the Napo population found to be generally more resistant than Amazon trees. The new strains will be propagated and tested in the infected districts of Trinidad. It appears that the new strains will want less shading. This is desirable also from the point of view that disease resistance seems to increase with sunshine.

1528. CALLAN, E. McC. 633.74-2.73
Thrips resistance in cacao.
Trop. Agriculture, Trin., 1943, **20**: 127-35, bibl. 3.
Methods of field selection of cacao resistant to cacao thrips (*Selenothrips rubrocinctus*) are described. Resistance appears to be based on the ability of the leaf to resist puncturing rather than, to any plant characters associated with the growth habit. So far in Trinidad only one selection, RT 18, has been found which is both resistant and produces good cacao. The laboratory tests for thrips resistance are described. They consisted of food preference tests with leaf discs and obligatory food tests with entire leaves and propagated buddings and cuttings. An experimental field block of RT 18 and ICS 1 was established. Here, as in the laboratory tests, RT 18 proved considerably less acceptable, the thrips population being more than 7·5 times greater on ICS 1. Assuming the susceptible ICS 1 to have a coefficient of 0 and the immune type a coefficient of 1, the mean coefficient of RT 18 is 0·87. The pod value of the selection is 10 pods to 1 lb. of dry cacao and a yield of over 12 cwt. cured beans to the acre.

1529. DESHPANDE, R. B. 633.842
The cultivation of chillies.
Ind. Frmg, 1943, **4**: 188-91.
Advice is given on the cultivation of chillies in India and the control of its pests and diseases. The variety Imperial Pusa 46A and the strain 390 evolved by the Madras Department of Agriculture were observed by that Department to be fairly tolerant to thrips.

1530. RAMANUJAM, S. 633.85-1.523
An interspecific hybrid in *Sesamum* (*S. orientale* L. × *S. prostratum* Retz).
Curr. Sci., 1942, **11**: 426-8, bibl. 11.
The important oilseed crop, *Sesamum orientale*, being highly susceptible to the attack of the caterpillar *Antigastra catalaunalis* and to a virus disease, crosses with wild *Sesamum* species were attempted at the Imperial Agricultural Research Institute, New Delhi. Hybrids were obtained from crosses between *S. orientale* and *S. prostratum*, a vigorously growing pest and disease resistant species. The hybrid inherited pest and disease resistance from its *prostratum* parent, but was sterile, though flowering profusely. Colchicine bud treatment, however, restored fertility by doubling the chromosomes.

1531. BURKLAND, E. R. 633.87
Divi-divi offers tannin.
Agric. Amer., 1943, **3**: 154-6.
The supply of some other tannins being cut off divi-divi, *Caesalpinia coriaria*, has gained in importance. The pods of divi-divi trees contain 40-50% tannin. Cultivated under favourable conditions the tree will bear fruit before its 8th year, and will yield 150-300 lb. in a season. The area of distribution of wild trees ranges from sea level to 600 feet, and it flourishes chiefly along the Caribbean coast. The most extensive plantings in tropical America have been on Curaçao, where also experimental work has been carried out. Since freight charges were the dominant factor in regulating the price of divi-divi, the tannin is now removed in Venezuela in two factories and marketed from there in the form of pressed tablets or cakes said to contain about 60% tannic acid.

1532. MAYNE, W. W. 633.88.51
Notes on cinchona planting.
Plant. Chron., 1943, **38**: 222-4.
In the early years of cinchona planting in India propagation by cuttings was a favourite means of increase but fell into disuse when seed became abundant and the technique of raising it was perfected. In this paper the Russian method of propagation by cuttings and the Java method of grafting on *C. succirubra* are considered from the standpoint of their suitability for present Indian conditions. The need for propagation by cuttings or grafts is obvious, for even if it prove too cumbersome or expensive for large-scale plantings it will still be the means of propagation of selected clones for seed bearing. The problem is one of establishing conditions for the successful vegetative propagation of cuttings or grafts in India and of comparing their relative growth rates and bark production. By this means, from evidence already obtained, it should be possible to raise stands of cinchona with at least double the quinine content now given by seedling stands. The potential value of these methods could be ascertained in about 2 years. At the Government cinchona plantation in South India harvesting by coppicing is being studied, by which a carefully regulated series of vertical shoots is grown and harvested in rotation, thus avoiding the final harvest which ends with the destruction of the mature tree and rendering the plantation more or less permanently productive.

1533. MORRISON, B. Y. 633.88.51
Quinine from seed.
Agric. Amer., 1943, **3**: 131-3.
An account is given of the method of raising cinchona plants from seed as developed by the U.S. Plant Introduction Garden, Glendale, Maryland. Fresh seed sown on a surface of sifted sphagnum was covered with a frame and glass to conserve moisture and kept in a house at a constant temperature of 70° F. Higher temperatures are fatal while lower temperatures retard germination. Moisture was not allowed to vary and light was greatly reduced. The seeds germinated after 11-20 days. If seed has to be stored it must be kept from excessive heat and dryness. If necessary crowded seed flats can be maintained for 7 months in a cool temperature with reduced watering. Great amounts of humus are desirable in later stages to provide acidity and moisture. Good drainage is essential. Further handling routines do not differ much from usual practices. Budding and grafting are recommended for the propagation of valuable trees.

1534. FARIA, F. R. 633.88.51
Sôbre o desenvolvimento da cultura das quineiras. **(Increasing quinine production.)**
Rev. agron., Lisbon, 1942, **30**: 371-5.
The need for quinine to combat malaria in Portugal and her colonies is very great and the supply totally insufficient. It is perfectly possible to grow quinine in the Portuguese islands of S. Tomé, Cape Verde and Timor. In S. Tomé, which is the best suited, an annual weight of 50 tons of cinchona bark could be produced.

1535. BLAKE, S. F. 633.88.781.6
The divine plant of the Incas [Coca].
Agric. Amer., 1943, **3**: 114-6.
A brief historical account is given of the Andean shrub *Erythroxylon coca*, for centuries used as a non-intoxicating

stimulant on which the economic life of the Andean region largely depends, and also a present source of the anaesthetic, cocaine. The invigoration which follows the chewing of the leaf, especially at high altitudes, is due in no wise to its content of cocaine but probably to other volatile substances lost in the exported leaves. The short botanical description is illustrated by a photograph showing flowers, fruit and leaves. The plant is cultivated on the eastern slopes of the Andes from Colombia to Bolivia up to 6,000 ft. It is kept low for convenience of harvesting. The leaves, collected in March, June and November, yield about 4 oz. per plant at each picking. They are dried in the open, spread in layers 2 to 3 inches deep. Drying is complete in 8 hours and the leaves are then heaped and allowed to sweat for 3 days. Before baling they are sun-dried for half an hour. Two principal varieties reach the market, the large leaved Bolivian coca which is the richer in cocaine, and the small leaved Peruvian variety.

1536. JOHN, P. K. 633.912
Cultivation of *Hevea braziliensis* in India.
Plant. Chron., 1943, **38**: 48-50.

The area under *Hevea* in India amounted in 1942 to 136,605 acres of which 104,465 were in Travancore State. The present method of dealing with new planting land after clearing is to give a light burn only, leaving the larger timber unburnt. The light burn allows some undergrowth to spring up, checking erosion and destroying little humus, while the larger timber can be used in building up bunds and terraces. The usual methods of terracing, draining and digging of planting holes are followed. The number of trees per acre varies from 180 to 250. Seeds are sown 3 or 4 to the pit or germinated in nursery beds for transplanting a year later. Meanwhile the whole area is planted to cover crops. The average annual yield from seed-grown rubber is 300 lb. per acre. Bud grafted areas are now giving four times this amount. Budwood is obtained from clone nurseries and the stocks are budded by the modified Forkert patch method.* The slip of wood behind the bud is only removed the moment before insertion. The rate of budding by an experienced man is up to 250 plants per 7-hour day in the field and up to 300 in the nursery. Large trees are tapped on the half spiral alternate day system, but recent trials on 4 estates showed considerably increased yield with the double cut half-spiral once in 3 days and a rest period of 6 weeks from early February and again for 2 months in the monsoon period beginning 15 June. A note is given on the treatment of latex.

1537. BRANDES, E. W. 633.912
The outlook for plantation rubber in tropical America.
Chron. bot., 1943, **7**: 320-3.

A programme of inter-governmental co-operation for the introduction of large-scale *Hevea* rubber cultivation in tropical America is suggested in an address delivered at the Second Inter-American Conference on Agriculture, Mexico City, July 1942. Commercial plantings in blight-free areas should be made with a mixture of 3 groups of clones, e.g. (1) eastern, high yielding clones which are tolerant of leaf blight in favourable areas, (2) local nursery selections from the hybrid clonal seedlings just mentioned, and (3) Amazonian clones possessing very high resistance to leaf blight. Clones of group 1 can be immediately and safely utilized in all areas by top budding at the age of 1 year with highly resistant seedling material. Such a "three storied" tree with a 6-8 foot cylinder of richly yielding lactiferous tubes between a sturdy root system and a resistant crown insures high yield and resistance to leaf blight at the same time. The address emphasizes the need for many more demonstration plantations in different areas.

* For description, see "Vegetative propagation of tropical and subtropical plantation crops." *Tech. Commun. Bur. Hort.* 13, 1940, pp. 99, 3s. 6d.

1538. RUBBER RESEARCH SCHEME (CEYLON). 633.912
Planting material recommended for use in 1943.
Advis. Circ. Ceylon Rubb. Res. Scheme **20**, 1943, pp. 2.

Notes and recommendations on some planting clones of *Hevea* available in Ceylon.

1539. RUBBER RESEARCH SCHEME (CEYLON). 633.912
Increasing the crop from Ceylon rubber estates.
2nd Suppl. to Advis. Circ. Ceylon Rubb. Res. Scheme, **16**, 1942, pp. 2.

This circular makes suggestions additional to those offered in *Circular* No. 16 (*H.A.*, 1942, 12: 1053), with a view to obtaining maximum wartime production of rubber in Ceylon. The customary month's rest from tapping accorded to hevea in Ceylon when the trees are undergoing refoliation is not practised in Malaya and could be omitted without harming the trees or affecting the rate of bark renewal. Time is lost in Ceylon in waiting for the tapping panels to dry after rain chiefly because of the tendency with wet bark for the latex to overflow from the cut. The knives used in other countries where tapping starts earlier after rain makes a grooved cut which holds the latex better. The M.G. knife as used in Ceylon can be modified by a competent mechanic to make the side guards slope slightly inwards (6°) from the vertical, thus ensuring that the tapping cut will have a slightly inward slope. Tapping panels dry quickly after rain if the mosses and the flaky bark and epiphytes from the lower 8 ft. of the stem are cleaned off periodically. Rubber accumulated on the ground from overflow and late drips should be carefully collected at frequent intervals, as should any scrap forming on the stems.

1540. (U.S.A. DEPARTMENT OF AGRICULTURE FOREST SERVICE.) 633.913
Rubber from guayule.*
Trop. Agriculture, Trin., 1943, **20**: 161-3.

Guayule, *Parthenium argentatum*, is a shrub native of Texas and Mexico inhabiting chiefly the outwash fans of light limestone soils but responding well to cultivation. It is resistant to drought and, while dormant, to considerable frost, though requiring a mild climate for growth. The rubber is deposited in solid form in the cells under the bark, and to produce it the plant requires a short wet season followed by a long dry period and cool night temperature. The plant is destroyed when the rubber is collected, the peak cropping period being about five years. At this age the yield may be up to 1,800 lb. of rubber per acre, rubber content being 18% to 22% of the dry weight. Extraction is accomplished by crushing and pulverizing the entire shrub, including the roots, and floating the rubber particles off in water. Propagation is by seed which requires special treatment to ensure adequate germination. The seeds are placed in perforated drums revolving in water; after 24 hours the water and sediment is drawn off and the bath refilled with ½% to 1½% solution of calcium hypochlorite or sodium hypochlorite. After 2 to 4 hours the seed is washed, centrifuged to remove surplus water and sown while still moist. Seed may be stored for several years and still remain viable. Such old seed does not require pretreatment. The seed is sown in beds 4 feet wide by a machine which simultaneously sows the complete bed of 7 rows and covers it with a thin layer of sand. Watering is frequent till the seeds are up. For large-scale transplanting when 4 to 5 months old, the plants are reduced to uniform height by a mowing machine which clips the tops, then loosened in the bed by a blade which is drawn along under the plant and shakes them loose. They are pulled by hand, pruned of awkward roots and packed in wet moss for transport to the field. Transplanting is done four rows at a time by a tractor-drawn planting machine which opens a slot in the ground, inserts the plant and firms the soil. The machine

* For rubber growing in temperate climates, see also 1379-1389.

requires a crew of four and a driver; it plants 10,000 seedlings an hour or 10 acres per 10-hour day, the plant spacing being 28 inches by about 24 inches. Weeding is necessary since guayule cannot compete with agricultural weeds. The plants are harvested by a mechanical digger and collected from the windrow by another machine which chops the shrub and blows the chopped material into a truck trailer for transport to the factory. At the factory it is reduced to fine shreds by rollers. This material is fed with water into a rotating tube lined with hard silicon bricks and filled with smooth pebbles. Here the rubber particles are separated from the plant fibres. The mass now emerges into a settling tank where the waterlogged woody material sinks and the rubber floats, the particles agglomerating in the form of "worms". Further cleaning ensures the removal of the last of the debris and the rubber is then dried on trays in a vacuum drier for 3 or 4 hours prior to compression into slabs 5 inches thick and 100 lb. in weight. During the process of extraction the rubber acquires a resin content of about 16%. These resins must be removed for some products, though not for others. The extracted resins are valuable at the moment in the manufacture of plastics.

1541. PARDY, A. A. 633.913
Raw rubber.
Rhod. agric. J., 1943, **40**: 199-200.
The native methods of collecting raw rubber from the two species of *Landolphia* found in Southern Rhodesia are described. That resulting in fewest admixed impurities is to cut strips of bark two or three inches long at intervals of 9 to 12 inches along and around the vine stem as far as the native can reach and later to pick off the coagulated latex in the form of small pellets. These are then stuck together by natural adhesion to make long ribbons or sheets about $\frac{1}{16}$ to $\frac{1}{8}$ in. in thickness. Coagulation can be arrested by applying a weak solution of salt water or lime juice to the cut. Rubber collected and rolled into ball form dries more slowly and contains more debris, and hence is more difficult to grade. Brief notes are given of five other latex bearing plants which may have possibilities.

1542. BUDHIRAJA, K. L. 633.913
***Cryptostegia grandiflora*, R.Br. A rubber-bearing plant found in India.**
Curr. Sci., 1943, **12**: 154-5, bibl. 3.
The Forest Research Institute, Dehra Dun, is studying the possibilities of producing rubber on a large scale from *Cryptostegia grandiflora*, a woody climber with copious milky juice, growing in the plains up to 2,000 feet in all climates with a rainfall ranging from $\frac{1}{2}$ in. to 83 in. It thrives best in places with a rainfall of 20-40 in. Coagulum in the latex averages 20%, rubber and resin in the coagulum 80% and 10% respectively. *Cryptostegia* is reported to yield latex within a year of sowing. The main difficulty in the exploitation of this shrub is that it cannot be tapped in the orthodox way. Efforts are being made to develop a special technique.

1543. WILLIAMS, R. O. 633.913-1.556.8
Tapping of Castilloa.
Proc. agric. Soc. Trin. Tob., 1942, **42**: 277-83.
Instructions for tapping Central American rubber, *Castilloa elastica*, in Trinidad.

1544. SINGH, R. S. 634.1/2
Fruit tree varieties for the hills.
Ind. Fmg, 1942, **3**: 581-4.
The author suggests in what proportion apples, peaches, plums, apricots, cherries, and pears should be grown at different altitudes and he gives a list of varieties found to be commercially successful in Kumaun.

1545. WEBBER, H. J. 634.421
Extending guava production to California.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 228-33, bibl. 3.
Guava thrives on almost any type of land and there are thousands of acres which could be planted with this fruit, the only limiting factor being cold. At Riverside Experiment Station the guavas are slightly scorched by frost every 3 or 4 years and have been severely frozen back twice in 25 years. The severely frozen trees made a good recovery, especially those which were cut back to the ground immediately after the frost, and only one year's crop was lost. There is considerable variation between plants in resistance to the lighter frosts; a heavy frost affects all alike, though a few progenies are tender enough to be killed outright. Such types need not be propagated. There are very few clonal varieties, since propagation is usually by seed. Vegetative propagation by root cuttings is the most rapid way of producing clonal plants on their own roots and such plants do not need to be reworked if cut to the ground by frost. Owing to the great variation commercial plantations should not be made from seedlings. The guava is very high in ascorbic acid, the 6 varieties examined at Riverside containing from 164 to 971 mg. per 100 c.c. in the expressed juice. Except in the case of Rolfs, the richest in ascorbic acid, the white fleshed fruits had a higher ascorbic acid content than the red. Although this confirms findings of other workers the author considers this was probably due to chance selection of red types normally low in ascorbic acid. A great commercial future, it is suggested, awaits the dehydrated product.

1546. SINGH, L., AND KHAN, A. A. 634.441-1.541.5
How to prolong the life of mango bud-wood.
Punjab Fruit J., 1943, **7**: 1264-5.
The response to the authors' previous publication on mango budding *in situ* (*Punjab Fruit J.*, 1942, 6: 1195-1206; *H.A.*, 13: 1028) was so enthusiastic that a technique had to be worked out for transporting the bud-wood over greater distances. The following treatment will keep the wood in budding condition for 48 hours:—the cuts of the budstick are made at least $1\frac{1}{2}$ in. away from the sound buds. Both ends of the budstick are dipped in melted paraffin wax for a second, not deeper than $\frac{1}{4}$ in. The sticks are then placed in thermos bottles, previously rinsed with ice cold water, and a little ice cold water (not ice) is added to cover the bottom $\frac{1}{2}$ in. deep. This procedure must be repeated after 24 hours.

1547. GUEST, P. 634.57-2.191
The relationship between chlorosis of *Macadamia* seedlings and certain chemical constituents of *Macadamia* seedlings.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 61-4, bibl. 1, being *Pap. Hawaii agric. Exp. Stat.* **96**.
A low iron content in *Macadamia ternifolia* seeds was found to be associated with chlorosis of seedlings. Deficiency of manganese could not be so associated. The paper presents a nice exercise in statistical analysis.

1548. HARVEY, P. H., AND SCHULTZ, E. F. 634.58-1.535
Multiplying peanut hybrids by vegetative propagation.
J. Amer. Soc. Agron., 1943, **35**: 637-9, bibl. 3.
Pollination of peanuts for hybridization being a very tedious task a method of vegetative propagation was developed at the North Carolina Experiment Station, Raleigh, for the benefit of the breeder. Hormone-treated cuttings from peanut main or lateral stems were shown to root well and to be at least equal in yield to plants raised from seed. The early testing of hybrid populations will thus be greatly facilitated, since one F_1 plant can be multiplied 20-50 times from cuttings in one winter season.

1549. COLLIER, H. C. 631.8: 634.61
Fertilizer from cocoanuts.
Proc. agric. Soc. Trin. Tob., 1942, **42**: 285-9.
Growers in Trinidad are urged to use the ash of coconut husks as a valuable source of potash. According to H. H. Croucher, Jamaica, the ash contains 31·28% total potash and 7·87% total lime. The same author found that sulphate of ammonia and coconut husk potash should not be mixed to avoid loss of nitrogen; sulphate of ammonia should be applied first and the ash a week or two later or after the first heavy shower of rain. It is considered safe to mix the ash with other fertilizers. The coconut potash is unsuitable for citrus crops because of its soda and chloride content, neither should it be used on heavy clay soils. The ash obtained from fresh dry husks in the usual slow-burning heaps was found to be richer in potash than when burnt in furnaces.

1550. SALGADO, M. L. M. 634.61-2.19
Note on physiological stem bleeding of mature coconut palm.
Trop. Agriculturist, 1943, **98**: 31-5, bibl. 1.
Physiological types of stem bleeding of coconut in Ceylon, as distinct from the pathological manifestation caused by *Thielaviopsis paradoxa*, may according to Petch* be caused by lightning, fire or root disease. Two further types of physiological stem bleeding which have been noticed of recent years are now described. (A) *Bleeding following manuring*, observed on 2 estates. (1) On a neglected estate at Nattandiya after manuring with a mixture of 2 lb. cyanamide, 4 lb. bone meal and 1½ lb. muriate of potash. The soil was sandy loam, the trees about 50 years old. (2) On an estate at Lunuwila, the trees being 40 years old and the soil a well drained loam overlying a heavier subsoil. Napier grass as a fodder crop was grown between the palms. Bleeding occurred 6 months after a heavy manuring in December with a mixture of 6 lb. sulphate of ammonia, 4 lb. Saphos phosphate, 3 lb. muriate of potash per palm. The manuring was followed by a severe drought broken in May and June by heavy rains. No treatment was given and the bleeding gradually passed away. It is attributed to a discharge of excess sap caused by failure of the vascular system to transport the large amount of nutrient suddenly made available. (B) *Bleeding due to heavy rains following prolonged drought with rise of water table.* (1) Bleeding following floods. At Chilaw on heavy badly drained land over impermeable clay pronounced bleeding occurred, affecting the tissues to the depth of an inch following periodical flooding, especially where the water had stood for any length of time. There were no deaths. (2) Bleeding on lands with fluctuating water-table in the Northern Province. In three areas of the Northern Province severe bleeding often caused deaths. Here there are long periods of drought, often up to 6 months, followed by 4 months of heavy rain. Notes are given of the soil conditions in the susceptible areas. It is noted that on permanently water-logged lands at Chilaw, where the water-table is kept at a steady level by drainage, bleeding seldom occurs and this fact suggests the treatment that should be adopted. The practice of cutting out diseased tissue or tarring should continue.

1551. COOPER, W. C. 634.774: 577.15.04
Effect of growth substances on flowering of the pineapple† under Florida conditions.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 93-8, bibl. 5.
Clark and Kearns‡ have reported that the flowers of the smooth Cayenne variety of pineapple in Hawaii can be advanced or delayed by appropriate concentrations of naphthaleneacetic acid, naphthalene acetamide and naphthalene thioacetamide. Under Florida conditions, which differ considerably from those of Hawaii in rainfall, soil, fertilizer practice, length of day and temperature, the Abachi pineapple did not react in a similar manner. October treatments with naphthaleneacetic acid over a wide range of concentrations produced premature flowering while similar treatments applied in July failed to induce flowering. Ethylene induced flowering at either season.

* *Agric. J. roy. bot. Gdns, Ceylon*, 1909, Vol. 4, No. 22.
† For effect of potassium on pineapple, see 1182 (vii).
‡ *Science*, 1942, 95:536-7. *H.A.*, 12:1183.

1552. CLARK, H. E., AND KERNS, K. R. 577.15.04: 634.774: 581.163
Effects of growth regulating substances on a parthenocarpic fruit.
Bot. Gaz., 1943, **104**: 639-44, bibl. 13.
The effect of α-naphthaleneacetic acid sprays on the fruit development of pineapple plants was studied at the Pineapple Research Institute, Honolulu. Only the application of such relatively high concentrations as 0·05% produced a marked increase in size and weight of fruit (average weight of treated fruit 5·98 lb. as against 5·27 lb.). In addition, high concentrations retarded ripening by about a week and inhibited slip and sucker growth, whereas low concentrations stimulated the latter. The number of fruitlets was not influenced by the spray.

1553. LUNDELL, C. L. 581.9(728.2)
The vegetation and natural resources of British Honduras.
Chron. bot., 1942, **7**: 169-71, bibl. 6.

MOLESTINA O., E. 63(866)
Reseña agricola del Ecuador. **(Review of agriculture in Ecuador.)**
Chron. bot., 1942, **7**: 167-9.

STANDLEY, P. C., AND STEYERMARK, J. A. 581.9(728.1)
The vegetation of Guatemala, a brief review.
Chron. bot., 1943, **7**: 315-8.

POPENOE, W. 581.9(728.3)
Plant resources of Honduras.
Chron. bot., 1942, **7**: 217-9, bibl. 6.

SHREVE, F. 581.9(729.2)
The vegetation of Jamaica.
Chron. bot., 1942, **7**: 164-6.

VARADA RAJAN, B. S., AND PATEL, J. S. 633.523-2.4
Stem-rot disease of jute.
Ind. J. agric. Sci., 1943, **13**: 148-56, bibl. 10.

MONTES, J. A. 633.526.2
Breves apuntes sobre el cultivo del fique. **(Cultivation of the fibre plant *Agave americana* in Colombia.)**
Agricultura, Colombia, 1942, **14**: 1152-61.

RIASCOS, L. C. C. 633.71
Apuntes sobre el cultivo de tabaco. **(Notes on tobacco growing.)**
Agricultura, Colombia, 1942, **14**: 1099-1122.

STEINBAUER, C. E., AND OTHERS. 634.58
Performance of some large-seeded and small-seeded peanut varieties and selections in Virginia and South Carolina.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 240-4, bibl. 4.

STORAGE.

1554. SINGH, R. S. 664.85.11
Storage of apples in Kumaun.
Ind. Fmg, 1943, **4**: 74-6.

Investigations were made at the Government Fruit Research Station, Chaubattia, into methods of storing Kumaun apples well beyond December in order to make them tide over the market glut. Although all varieties grown in Kumaun were tested only Rome Beauty was found to keep till the end of January or middle of February without special treatment. The storage life of Delicious was related to fruit size in that small apples of the variety kept much better than large ones. Storing the fruit in peat proved just as good as storing them in linseed oil wraps, but peat is dearer. The treatment recommended to growers, therefore, is to wrap good quality apples in linseed oilwraps, instructions for the home manufacture of which is given. The storage of apples in heaps under a cover of moss in a room or primitive godown should be abandoned in favour of crates or racks in a brick storage godown fitted with top and bottom ventilators. In order to keep humidity constantly over 90% large shallow basins full of water should be placed by the side of the ventilators.

1555. WHITTAKER, E. C. 664.85.11
Common storage of apples.
Agric. Gaz. N.S.W., 1943, **54**: 221-2.

With many qualifications as to the general validity of his recommendations the author limits the keeping quality of some apple varieties in common storage in New South Wales as follows:—Granny Smith: 2-3 months; fruit from young or lightly cropped trees should not be kept for more than 4-5 weeks. Delicious: 4-5 weeks. Jonathan: 4-5 weeks for fruit of the size 2⅜-2¼ in.; 2-3 weeks for larger sizes; must not be picked too early. Democrat: 3-4 months; best keeping variety in common storage if fruit is not too large. Stayman: 3-4 weeks. Yates: 3-4 months. McIntosh Red and Fameuse: 2-3 weeks; loses flavour in prolonged storage. Gravenstein: 3-4 weeks. Fruit size is an important factor particularly with soft varieties. Good keeping sizes for Gravenstein and McIntosh Red are 2¾ in. and smaller, for Fameuse 2½ in. and smaller.

1556. WHITTAKER, E. C. 664.85.11.037
The cool storage of Granny Smith apples.
Agric. Gaz. N.S.W., 1943, **54**: 218-20.

The Division of Horticulture has studied the problem of storing Granny Smith apples in New South Wales, arising from the shortage of oiled wraps. Stocks should be spun out by wrapping alternate layers of only better class fruit, brought into cold storage not later than 2 weeks after picking. Apples wrapped in home-made oiled sheets should not be kept longer than November to early December. Instructions are given on how to impregnate sheets of paper with oil.

1557. FISHER, D. V. 664.85.11: 634.11
Mealiness and quality of Delicious apples as affected by growing conditions, maturity and storage techniques.
Sci. Agric., 1943, **23**: 569-88, bibl. 30.

Extensive investigations on the effect of growing conditions, harvesting and storage on mealiness and quality of Delicious apples were conducted at the Dominion Experiment Station, Summerland, B.C., based chiefly on fruit from growers' orchards and commercial cold storage plants in the Okanagan Valley. One year's work was carried out in Iowa with Iowa grown Delicious. Of the multitude of data recorded the following appear to have the greatest claim to a more general interest:—Apples picked mature turned mealy soon after ripening unless stored immediately at 32° F.; in contrast, apples picked immature did not tend to become mealy, but failed to develop the true Delicious flavour. Overripe apples acquired a disagreeable taste in whatever state of maturity they were harvested. Hot seasons have a beneficial effect on quality. After harvest Delicious became eating ripe in 2 weeks at 60° F., in 6-7 weeks at 40° F. and in 9-12 weeks at 32° F. The apples were overripe and mealy in 5-6 weeks at 60° F., in 15-16 weeks at 40° F., and in 24-27 weeks at 32° F. Respiration at 60° F., with a peak about 5 days after picking was double that at 40° F. and three times that at 32° F. Sugar losses through respiration during storage amounted to 1% of the fresh weight at picking or to 9% of the original respirable carbohydrate content. Hydrolysis of protopectins to soluble pectins and disappearance of starch were related to the rate of ripening. The starch-iodine test thus became a simple and reliable index of ripening in storage. If kept in an atmosphere of 2·5% O + 97·5% N at 32° Delicious apples did not deteriorate till February. Soluble pectin values were the same as at the time of picking. All other atmospheres (including CO_2 in different concentrations) and temperatures tested proved inferior in their effects on the keeping quality of Delicious apples.

1558. PHILLIPS, W. R., AND JOHNSTON, F. B. 664.85.11.037: 546.27
The effect of boron applications on the subsequent storage and physiological behaviour of McIntosh apples.
Sci. Agric., 1943, **23**: 451-60, bibl. 5.

Cold storage observations were made on McIntosh apples from an orchard at Brighton, Ontario, on which all methods of boron application had been employed for several years past. Boron applied to the extent recommended to trees deficient in this element results in an increase of core flush in storage. From the fact that core flush is bound up with immaturity at picking and from field observations of the fruit itself it may be concluded that boron delays maturity. Apples with a higher boron content reach the climacteric peak in store at a later stage than boron starved apples. Ethylene content trends assume a characteristic curve depending on the stage of maturity at harvest. In high boron apples these trends conform more closely to those of more immature apples than in low boron apples. This tendency is more definite than any of the other criteria and may be taken as definite proof that at least some phases of maturity progress were influenced by boron content. Core flush in boron treated apples could be materially reduced by delaying the harvest.

1559. SMITH, W. W. 664.85.11: 632.19
Development of the storage disorder brown core in McIntosh apples.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 99-103, bibl. 12, being *Sci. Contr. biol. Inst. N. Hampshire* **6**.

At the New Hampshire Experiment Station examination in April 1939 of McIntosh apples stored at 32° F. suggested that lack of maturity at picking may be responsible for the development of brown core and of stem end rot and that these two disorders are associated. In the season 1939/40 further evidence was obtained to support this conclusion in respect of brown core. Examination of records for the period 1935/40 gave some indication of control by late picking in light brown core years but not in those years when the disease was severe. In 1940/41, a year of severe brown core, late picking gave no control, but it was statistically significant that more brown core developed on the north than on the south side of the trees. It is observed that severe brown core has occurred in years when rainfall has been high and temperature low during the maturing of the fruit, whereas light brown core years have been relatively dry ones.

1560. GERHARDT, F., ENGLISH, H., AND SMITH, E. 664.85.23
Respiration, internal atmosphere and moisture studies of sweet cherries during storage.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 119-23, bibl. 1.

Respiration of Lambert cherries was considerably influenced by temperature, being 115% greater at 45° F. than at 31° F. In an atmosphere of 20% CO_2 at 36° F. Lambert cherries accumulated 2·3 times their normal intercellular content during the first half-hour of storage and 4·5 times the normal within 3 hours. The rate of dissipation of the accumulated CO_2 into normal air was considerably faster than the rate of accumulation and the degree of accumulation appeared to be dependent upon the concentration of CO_2 in the storage air. The stem of the sweet cherry shrivels and discolours easily. Moisture losses into stems were not influenced by gas storage or by storage temperatures at normal humidities. A delay in storage of 15 hours at harvest induced shrivelling, discoloration and a large increase in moisture loss from the stem during storage at 45°. The humidity and temperature of post-storage or transit environment had marked influence on stem condition and special precautions are necessary if greenness and freshness of stem are to be maintained during marketing.

1561. MILLS, P. A. 664.85.037: 581.192
Report on sampling cold-pack fruit.
J. Ass. off. agric. Chem. Wash., 1943, **26**: 335.

A hollow trier, 2 in. in diameter and 30 in. long, with large saw teeth cut into one end, used for sampling fruit in the frozen state is described. A comparison of samples taken at the time of packing and later from the frozen barrel indicated that with blackberries and strawberries the ripening process continues during freezing and possibly in storage, though not so markedly with strawberries as with blackberries. The author recommends the continuation of the study with a new trier of stainless steel tubing, 1 inch inside diameter and 40 inches long, fitted with removable cap and enabling the use of an electric drill.

1562. BARTON, L. V. 631.531: 664.84
Effect of moisture fluctuations on the viability of seeds in storage.
Contr. Boyce Thompson Inst., 1943, **13**: 35-45, bibl. 2.

The effect of moisture fluctuations on the viability of onion, dandelion, eggplant and tomato seeds was studied at the Boyce Thompson Institute for Plant Research, New York. Seeds of the first two plants are very sensitive, those of the second two are relatively resistant to adverse storage conditions. In the tables and graphs only the data for onions are presented, since dandelion seeds reacted in a similar manner and the viability of eggplant and tomato seeds was affected only by a constant relative humidity of 76% up to 64 weeks. Onion seeds did not suffer from one year's storage at a constant relative humidity of 35% at 20° C. The moisture content of the seeds under such conditions was approximately 9%. At 55% relative humidity serious deterioration occurred after 20 weeks of storage, the seeds having absorbed 11% of moisture. After 12 weeks' storage at 76% humidity only 23% of the seed germinated, their moisture content being 15%. Up to 16 weeks' storage 2-, 4-, 8-weekly alternations in relative humidity between 35 and 55%, 35 and 76%, 55 and 76% resulted in a viability intermediate between the effects of the two humidities concerned, with the exception of the 8-weekly alternations between 35 and 76% and 55 and 76%. In that case the seeds deteriorated as quickly as they would have done if stored at 76% only. After 16 weeks the germination capacity curves also from 2- and 4-weekly alternations almost approached the deterioration curve of 76% humidity, since the lower humidity could no longer counteract the harmful effect of high humidity. Similar experiments were carried out at a storage temperature of 25° C. From this set of experiments emerged the interesting result that fluctuations of humidity levels, when continued for periods as long as 12 weeks, are more deleterious to viability of seeds in storage than is a constant humidity at the higher of the two levels, especially if a relatively high moisture content is involved.

1563. BARTON, L. V. 634.3-1.531: 664.85.3
The storage of citrus seeds.
Contr. Boyce Thompson Inst., 1943, **13**: 47-55, bibl. 6.

Optimum storage conditions for seeds of grapefruit, sweet orange, sour orange and rough lemon were studied at the Boyce Thompson Institute. It is a known fact that all seeds in question require a relatively high humidity. Drying of grapefruit and sweet orange seed on blotters in the laboratory to 52 and 25% moisture content respectively, calculated on dry weight basis, was injurious to the germinating capacity. However, a reduction in moisture content to approximately 17% in open storage in a humid atmosphere at 5° C. was not harmful. On the contrary storage under such conditions preserved viability longest, at least a year for grapefruit seed. 5° C. was found also to be the best temperature for keeping sour orange and rough lemon seeds. The two latter could be dried even to 4% and still retain 25% and 50% of their original germination power. Viability in sealed containers was low under conditions of high humidity, but better than that of seeds in open storage at laboratory temperature, if the moisture content was reduced to 60%. Occurrence of moulds somewhat obscured the results of storage in sealed containers. A temperature of −5°, beneficial for the keeping of many seeds, proved very harmful to citrus seeds.

1564. DONOHOE, H. C. 664.85.771: 632.944
A comparison of methods for the fumigation of empty banana refrigerator cars with liquid hydrocyanic acid.
J. econ. Ent., 1943, **36**: 328-9.

Tests conducted by the U.S.D.A. Bureau of Entomology and Plant Quarantine revealed that the use of 50 square inch pans and the splashing of 8 ounces of hydrocyanic acid against opposite walls were just as effective for the fumigation of empty banana refrigerator cars as the more circumstantial method demanded by the quarantine regulations.

1565. BIALE, J. B. 664.85.653
Preliminary studies on modified air storage of the Fuerte avocado fruit.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 113-8, bibl. 1.

Fruit softening of Fuerte avocado was definitely delayed and the fresh appearance of the skin retained longer under a modified atmosphere containing 3·6 to 5·6% oxygen and 2·9 to 4·9% carbon dioxide.

1566. OMAN, D. E. 664.84.037
Frozen foods will hit new high in 1943.
Domestic commerce, June 1943, from reprint *Fruit Prod. J.*, 1943 **22**: 334, 345.

Owing to big Army orders and increased civilian demand it is expected that the production of frozen vegetables in the U.S.A. will rise from 164 million lb. in 1942 to 264 million lb. in 1943. In order to fulfil this programme existing freezing plants are being expanded and additional cold storage place is being built. It is anticipated that after the war frozen food will be in demand to the same extent as it is now.

1567. DENNY, F. E., AND THORNTON, N. C. 664.84.21.037
Effect of post harvest pre-storage conditions on the rate of development of sugar in potato tubers during subsequent cold storage.
Contr. Boyce Thompson Inst., 1943, **13**: 65-71, bibl. 3.

Potato tubers were subjected to a variety of conditions after harvest and before storage. The effect of such conditions

made itself felt only in subsequent cold storage at 5° C. Tubers pre-stored at 15° C. formed about half as much sucrose as tubers pre-stored at 23·3° C.-24·4° C. or 19·8° C. in atmospheres of different humidity.

1568. DENNY, F. E., AND THORNTON, N. C. 664.84.21.037
The effect of low concentrations of carbon dioxide upon the sugar content of potato tubers in cold storage.
Contr. Boyce Thompson Inst., 1943, **13**: 73-8, bibl. 4.

The presence of 4·9% CO_2 in the atmosphere surrounding potato tubers in cold storage at 5° C. caused the reducing sugar over a period of 45 days to increase only one-third as much as that of the control. The sucrose content increased. A concentration of CO_2 as low as 1·1% had still the effect of delaying the increase of reducing sugar by about 20% and of increasing the gain of sucrose by about 30% during 30-40 days.

1569. VÖLKSEN, W. 664.84.21
Der Einfluss der Lagerung auf die Stärkekörner der Kartoffelknolle. (**The influence of storage on the starch grains of potato tubers.**)
Landw. Jb., 1943, **92**: 509-28, bibl. 33.

Storage of potatoes from autumn to March had little influence on the size of starch grains. With increased respiration and commencing germination in spring the loss in size became marked, the majority of the grains decreasing from 50-60μ in March to 20-30μ in August. The yield in starch after March is reduced both in quantity and in quality. The literature on potato starch grains is briefly reviewed.

1570. MATHLEIN, R. 632.76: 664.82
Undersökningar rörande förrådsskadedjur. III. Svartbruna mjölbaggen, *Tribolium destructor* Uytt. Ett nytt, ekonomiskt viktigt skadedjur. (**Investigations on storage pests. III. The black-brown flour beetle, *Trilobium destructor* Uytt. A new economically important pest.**) [German summary 5 pp.]
Medd. Växtskyddsanst. Stockh. **41**, 1943, pp. 38, bibl. 9.

The life history of this pest, which is beginning to do serious damage in seed stores, mills and bakeries in Sweden, is described in detail. Its life span can extend to over 4 years. The beetle's lack of resistance to higher and lower temperatures should offer suitable means of control. The possibility of gassing is also discussed.

1571. JEFFERSON, R. N. 632.76: 632.944
Influence of carbon tetrachloride on the toxic efficiency of certain volatile organic compounds.
J. econ. Ent., 1943, **36**: 253-9, bibl. 32.

The toxic effect of methyl bromide and methyl formate proved much greater than that of ethylene dichloride and carbon tetrachloride to the red flour beetle, *Tribolium castaneum*, in fumigation experiments at Iowa State College, Ames.

1572. MONRO, H. A. U., AND DELISLE, R. 632.944
Further applications of methyl bromide as a fumigant.
Sci. Agric., 1943, **23**: 546-56, bibl. 10.

Methyl bromide proved effective as an atmospheric fumigant when used at atmospheric pressure and at temperatures above 60° F. in doses of 1·5 to 2 lb. per 1,000 cu. ft. for 16-18 hours at the Department of Agriculture Fumigation Station, Montreal, against insects in broom corn imported from U.S.A. and Argentina. The material can be treated in air-tight refrigerator or steel box cars. In the vacuum treatment complete mortality of all insects was obtained with a dose of 2·5 lb. methyl bromide per 1,000 cu. ft. of vault space in a sustained vacuum of not more than 2 inches of absolute mercurial pressure for a period of 2·5 hours, with vault and bale temperatures of not less than 75° F. and 60° F. respectively. With the safeguards which are described there is no danger to employees. The fumigant was effective in destroying the larvae of the pea moth (*Laspeyresia nigricana*) in green peas when applied at the rate of 2 lb. per 1,000 cu. ft. for 2 hours at normal summer temperatures. Germinative powers were not affected nor were the peas rendered in any way unsuitable for consumption.

1573. DAINES, R. H., AND NISSLEY, C. H. 664.85 + 664.84
Home storage of fresh fruits and vegetables.
Circ. N. Jersey agric. Exp. Stat. **460**, 1943, pp. 12.

CURTIS, L. C. 664.84.11: 581.192
The effect of storage on the betanin and sucrose content of garden beets (*Beta vulgaris*) and its importance in a breeding program with this crop.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 370-4, bibl. 5.

PROCESSING AND PLANT PRODUCTS.

1574. VAN SCHALKWYK, S. J., AND SNYMAN, S. 634.11: 613.2
The value and use of apples.
Fmg S. Afr., 1943, **18**: 537-40, bibl. 3.

The relative food values of apple and milk are compared. The cooking qualities of various apples grown in S. Africa are discussed. Of these, Ohenimuri, Versfeld, Cleopatra and Reinette de Canada retain their shape when cooked. Recipes are given for cooking, bottling and for the preparation of the juice as a source of pectin for use in jam making with pectin deficient fruits.

1575. LEUTHOLD, R. 634.1/8-1.556.1
Besinnliches zur bevorstehenden Verwertung unserer Obsternte. (**Methods of dealing with the coming fruit crop in Switzerland.**)
Schweiz. Z. Obst-u. Weinb., 1943, **52**: 474-6.

A report given by an expert at the annual meeting in May, 1943, of the Swiss association for utilization of non-fermented fruit showed that 100% of the barrels tested in a number of cellars were infested with moulds, chiefly *Penicillium* species. The author does not share the common belief that moulds are desirable because their enzymes help to clarify the must. He has always advocated glass containers and urges now an investigation into the effect of moulds on human digestion. He also deprecates the waste of valuable materials due to their presence.

1576. VILLFORTH, F. 634.1/8: 581.192
Aromastoffe im Obst. (**Aromatic substances in fruit.**)
Gartenbauwiss., (undated), from abstract in *Schweiz. Z. Obst-u. Weinb.*, 1943, **52**: 479-80.

Preliminary investigations into the composition of aromatic substances in plums and apples were carried out at Geisenheim in Germany. Esters were found to be the chief carriers of aroma. Waxy substances isolated from 12 apple varieties contained a strong aroma characteristic of each variety and very susceptible to the influence of light and air when concentrated. The wax of apples had a much higher melting point than that of plums. Analyses of fermented plum juices showed clearly discernible differences in the content of volatile esters. Such differences may serve as a basis for evaluation of quality. Further investigations, especially in relation to pigments, are planned.

1577. Lineberry, R. A., and Burkhart, L. 634.7: 577.16
The vitamin C content of small fruits.
Proc. Amer. Soc. hort. Sci. for 1942, 1942, **41**: 198-200, bibl. 6.

Ascorbic acid in small fruit tissue was efficiently extracted in 1 minute with a metaphosphoric acid mixture in an emulsification blender. American strawberries showed considerable varietal differences in ascorbic acid content, 32 to 66 mg per 100 g. Sunshine and field location markedly affected the ascorbic acid content of Klondike. The approximate mean content for blueberries was from 16 to 18 mg. and only 3·3 mg. for green fruit. For dewberries the content varied from 27 to 32 mg., for raspberries 20 to 33 mg., Early Wonder blackberry showed 23·5% whereas Brainerd showed 12·9% only.

1578. Rege, N. D., and Devadatta, S. C. 581.192: 634.1/8
Vitamins, minerals, carbohydrates and proteins in fruits. II.*
Curr. Sci., 1943, **12**: 20-1, bibl. 3.

Analyses at the Wilson College, Bombay, are given of the protein, sugar, phosphorus, calcium, vitamin B_1 and vitamin C contents of the following 10 fruits:—Chiku (*Achras zapota*=sapodilla), orange, figs, guava (*Psidium guajava*), 3 types of plantain, viz. velchi, green skin, rasbali (*Musa sapientum*), red and yellow-green apples, yellow (*Vitis vinifera*) grapes.

1579. Namjoshi, A. N., and Devadatta, S. C. 581.192: 635.2
Vitamins, minerals, carbohydrates and proteins in tubers. I.
Curr. Sci., 1942, **11**: 463-4.

At Wilson College, Bombay, analyses of colocasia (*Colocasia antiquorum*, Allahabad variety), elephant's foot (*Amorphophallus campanulatus*, Surat variety), potato (Talegaon variety), sweet potato (*Ipomoea batatas*, Konkan variety), radish (large white variety), Knokol (*Brassica oleracea* kohlrabi), turnip (white napiform variety), beetroot, carrot (orange conical variety) were undertaken for vitamins B and C, phosphorus, calcium, iron, carbohydrates and proteins.

1580. Barton, L. H. C. 634.51: 577.16
Green walnuts as a source of vitamin C.
Food Manuf., 1943, **18**: 254-6, bibl. 2.

Green walnuts are placed at the head of a list of fruit and vegetables for their vitamin C content, *Juglans regia* being the richest of the several walnut species for which data are available. Preservation in brine or vinegar appears to leach out most of the vitamin but green nuts preserved in syrup and sulphite solution (1,000 p.p.m. SO_2) showed good retention. It was noticed that domestic preparations of pickles containing green walnuts showed much better retention than similar commercial products, but when 10% green walnuts were added to either home-made or commercial jams the vitamin was comparatively stable. Treatment of jams in this manner would add to their food value without affecting their flavour and usefully dispose of the green walnut crop now largely wasted in England. The total crop for England based on recent returns during a good year should be 7,000 tons containing 70 tons of vitamin C.

1581. Lampitt, L. H., Baker, L. C., and Parkinson, T. L. 635.1/7: 577.16
The vitamin-C content of raw and cooked vegetables.
J. Soc. chem. Ind., Lond., 1943, **62**: 61-6, bibl. 17.

The concentration of vitamin C in samples of 35 vegetables, chiefly purchased in the open market including 92 samples of cabbage and not less than 7 samples of the other sorts has been determined after cooking in fast boiling water. Estimates were made of the percentage of vitamin C (*a*) retained by the vegetable, (*b*) leached out by the cooking water, (*c*) destroyed. Highest percentage retention, in descending order, was shown by potatoes, brussels sprouts and peas, next come root vegetables and cauliflower, the poorest retention being shown by leafy vegetables such as kale, cabbage, spinach and by marrow. But since raw leafy vegetables have normally a high concentration of the vitamin C, the amount actually retained is high compared with that of most cooked vegetables. The volume of water in which cabbage was cooked only slightly influenced retention in favour of the smaller volumes. Only in cabbage did the addition of the vegetable slowly to boiling water, so that it did not go off the boil, result in greater retention of vitamin C. Cabbage cooked by steaming retained 65% vitamin C compared with 45% for fast boiling, but colour and flavour is considered by many to deteriorate on steaming. When cooked vegetables were kept hot the vitamin C content was halved within 1 to 2 hours. In cabbage there was a marked seasonal range in vitamin C concentration.

1582. Burkholder, P. R. 631.556.3: 577.16
Vitamins in dehydrated seeds and sprouts.
Science, 1943, **97**: 562-4, bibl. 4.

At the Osborn Botanical Laboratory, Yale, sprouted seeds of cereals showed a much greater gain in vitamins expressed as micrograms per gram of dry matter than could be accounted for on the basis of increased concentration through loss of dry matter—mere maintenance of vitamins stored in the seed. Germinated peas and buckwheat also showed gains in certain substances. It is not expected that all species of plants will show such substantial increases in vitamin content. It is remarked that the common use of sprouted seeds in the diet of oriental peoples thus rests on a sound nutritional basis.

1583. Coates, M. E., and Bacharach, A. L. 577.16: 634.1/8 +635.1/7
The vitamin P activities of some British fruits and vegetables.
J. Soc. chem. Ind., Lond., 1943, **62**: 85-7, bibl. 4, abstracted in *Biochem. J.*, 1943, Vol. 37 (*Proc. biochem. Soc.*, p. iv).

The following authors' abstract is reproduced from the *Biochemical Journal*. "By the methods previously described* biological tests have been carried out to compare the vitamin P activities of between 20 and 30 different vegetables or fruits and that of a provisional standard preparation, a water-soluble concentrate of citrus origin. Activities ranging from 0 (lentils) to 132 units (spinach) per 100 g. have been found. Full assays were carried out on 11 different vegetable products, which were contemporaneously tested for ascorbic acid content. There was no correlation. The vitamin P activity also bore little if any relationship to the colour of the product tested. The vitamin P content of peas was doubled after a few days' germination, but the ascorbic acid content increased nearly 20-fold." To this may be added the authors' concluding remarks in the original paper. "Taking vegetable foods in general groups, fruits appear to be the richest source, with green leaves at least a good second, while roots seem to be much inferior, and seeds of no value as sources of vitamin P."

1584. Charley, V. L. S., and Pollard, A. 635.937.34: 577.16
Spray-dried rose hip powder.
Nature, 1943, **152**: 354-5, bibl. 2.

Ground rose hips were boiled with twice their weight in water for half an hour, the liquor being removed by hydraulic

* For estimations of carbohydrates, see *J. Univ. Bombay*, 1941, 10: 3: B.74.

* Bacharach, A. L., Coates, M. E., and Middleton, T. R., *Biochem. J.*, 1942, 36: 407; Bacharach, A. L., and Coates, M. E. *Analyst*, 1942, 67: 313.

pressure. The thick pectinous fluid thus obtained on concentration gave a material with the analysis:—specific gravity 1·095, ascorbic acid 219 mg./100 g. The pectic substances were not removed since their presence was known to assist the process of spray-drying and in the retention of ascorbic acid. By air-drying the concentrate in a semi-commercial Kestner machine a smooth, free-flowing powder was produced. Using an air outlet temperature of 85-90° C. a powder was collected which retained 5·1% of moisture and 979 mg. ascorbic acid/100 g., thus showing a negligible loss in the drying process. The powder was gas-packed in cans and stored at room temperature for 3 months and on opening showed a loss of not more than 3% of the ascorbic acid value. With better quality hips than those used for the experiment higher figures should be obtained. The production of such a powder might enable ascorbic acid to be added to certain solid food materials in this form.

1585. OSBORN, R. A. 663.813: 581.192
Chlorine in ash of fruit products.
J. Ass. off. agric. Chem. Wash., 1943, **26**: 437-40.
Studying ashing procedures and chlorine recovery in commercial samples of canned orange juice, the author recommends the use of sodium carbonate as a chlorine fixative during ashing for fruits and fruit products, where chlorine is to be determined quantitatively.

1586. HARTMANN, B. G. 634.1/8: 581.192
The polybasic acids of fruits and fruit products.
J. Ass. off. agric. Chem. Wash., 1943, **26**: 444-62.
The properties and the analytical behaviour of tartaric acid, citric acid, malic acid (laevo), inactive malic acid (racemic acid), isocitric acid and tannin and colouring matter are reviewed and serviceable methods of their analysis in fruits and fruit products are described.

1587. WOOD, C. A. 634.1/8: 581.192: 546.32
Rapid modification of A.O.A.C. chloroplatinate method for determination of potassium in fruit products.
J. Ass. off. agric. Chem. Wash., 1943, **26**: 472-6.
A short gravimetric chloroplatinate method for the determination of potassium in fruit products giving results in good agreement with the A.O.A.C. method is described. A colorimetric recovery of K_2O from K_2PtCl_6 is also suggested.

1588. SHUMAN, H. 634.1/8: 581.192: 546.18
Report on P_2O_5 in fruits and fruit products. Volumetric method.
J. Ass. off. agric. Chem. Wash., 1943, **26**: 334-5.
Collaborative results for the determination of P_2O_5 in fruits and fruit products show that results obtained by the volumetric method are in good agreement with those obtained by the official colorimetric method.

1589. OSBORN, R. A. 634.1/8: 581.192: 546.32
Report on fruits and fruit products. Potassium.
J. Ass. off. agric. Chem. Wash., 1943, **26**: 324-31.
Suitable methods of sample preparation and potassium determination are presented showing that the shorter gravimetric chloroplatinate modification gives reliable results for the determination of potash in fruits and fruit products.

1590. GERRITZ, H. W. 634.1/8: 581.192: 546.32
Report on potassium in fruits and fruit products. Volumetric chloroplatinate method.
J. Ass. off. agric. Chem. Wash., 1943, **26**: 332-4.
A comparison of results obtained by volumetric chloroplatinate and official methods indicates that the former is a suitable method for the determination of potassium in fruits and fruit products.

1591. PUNJAB. 664.85
Fruit preservation in the Punjab.
Punjab Fruit J., 1942, **6**: 1059-1113.
The numerous articles contained in this "fruit preservation number" should do much to supply the strong demand for literature dealing with the subject from the standpoint of India. The issue contains an article each on the future of the fruit preservation industry in India and the effect of the war upon it. As regards the latter the effect has been the establishment of a large number of preservation plants, all handicapped by the shortage of containers. Suggestions for government assistance in the establishment of can and bottle making factories are advocated. The equipment necessary for a fruit preservation factory is discussed and illustrated in a third paper. The addresses are given of local and foreign firms specializing in the machinery and numerous other articles required and of firms supplying the products and of nurserymen. There are 11 papers in which the preparation and preservation of various fruits and vegetables and their juices are described in detail. The symposium concludes with a summary of the work done in fruit and vegetable preservation at the Fruit Products Laboratories, Lyallpur.

1592. CRUESS, W. V. 664.84.047
General principles of dehydration.
Fruit Prod. J., 1943, **22**: 356-61.
Some basic principles of dehydration are presented under the following headlines:—Constancy of weight and energy; latent heat of vaporization; effect of moisture content on heat requirement for drying; functions of air in dehydration; measurement of relative humidity; effect of air velocity on drying rate; relation of relative humidity of air to moisture content of dried product; effect of humidity on critical temperature; relative humidity and case hardening; constancy of wet bulb temperature; recirculation of the air; effect of variety of vegetable on drying rate; effect of tray load on drying rate; effect of size and shape of pieces on drying rate; rate of removal of moisture at different stages of dehydration.

1593. CRUESS, W. V. 664.84.047 + 664.85.047
Some observations on dehydration.
Fruit Prod. J., 1943, **22**: 265-8, 285, 300-2, 308, 331-3, 341, bibl. 35.
This article is the résumé of a lecture presented to the Dehydration School, Albany, California. Progress in this new science is concisely detailed under the following headings:—Effect of war on drying of canning crops; advantages and disadvantages of dried foods; present programme of Fruit Products Division; early dehydration in California; early vegetable dehydration in California; the University dehydrater; walnut dehydration studies; publications now out of print; effect of plant investment cost; cost of dehydration; fuel efficiency, typical air flow measurements; static pressure and recirculation; effect of air distribution; summary of bulletin 330* on dehydration of fruits—with a large number of sub-headings. University of California's early work on vegetable drying.

1594. DAVIS, M. B., AND OTHERS. 664.84.047
Factors affecting the quality of dehydrated vegetables.
Reprinted from *Proc. Inst. Food Technol. 1942*, pp. 90-8, bibl. 4.
The conservation of vitamins in dehydrated vegetables stored at high temperatures was the chief object of studies carried out by the Experimental Farm Services, Canada. The main factor affecting the vitamin content was peroxidase activity. Figures are given for the blanching treatment required to destroy peroxidase in several crops and for the operation of the dehydrator relating to air velocity, tray load

* Cruess, V. W. and Christie, A. W. *Bull. Calif. agric. Res. Stat.*, 330, 1921.

per square foot, temperatures at starting and finishing and drying time. Four tables indicate the losses of ascorbic acid and carotene under varying storage conditions in the presence and absence of peroxidase. Attempts to find a tin substitute for a gastight package are continuing. An appendix contains recipes for large-scale cookery of dehydrated vegetables.

1595. CROSBIE-WALSH, T. 664.8.047
Dehydrated foods for man and beast.
Agriculture, 1943, **50**: 231-3, bibl. 4.

A brief account of recent developments and of Government plans with reference to drying vegetables, grain and grass.

1596. ANON. 664.85.047
Fruit drying experiments at Ditton.
Food Manuf., 1943, **18**: 251-3.

Some account is given of the results obtained from the English fruit drying experiments started at Ditton Laboratories in 1942. *Plums.* Czar when dried closely resembles imported prune in appearance both in the dried state and when cooked. Victoria, greengage, damson and Early Rivers plums can be treated to retain their normal colour, and when cooked are indistinguishable from stewed fresh fruit both in appearance and flavour. To ensure a high sugar content only fully ripe fruit is used. Before drying the fruit is dipped in 1% caustic soda lye and then washed. The lye removes the bloom and produces small cracks in the skin and the process accelerates drying considerably. Of the material available for drying-trays wood has proved the most suitable. The trays of fruit are placed on shelves in a closed chamber and subjected to a temperature of 158° F. for 8 to 9 hours. Some movement of the fruit on the trays is necessary at first to prevent sticking, and for commercial processing some form of mechanical agitation of the trays could be devised. The colour and flavour may be preserved by treating with sulphur dioxide fumes adjusted to suit the variety, but Czar if so treated fails to acquire the black lustre which is an attraction in imported prunes. Subsequent storage temperature affects colour and flavour, for example Victoria stored for 6 months at 40° F. and 50° F. retained its original colour and flavour, but stored at 70° F. and 90° F. became progressively more prune-like in appearance and flavour. *Apples.* The fruit is peeled and cut into rings or chips and sulphured. The subsequent drying takes 3 or 4 hours, and if storage temperature does not exceed 50° F. the product retains an even cream colour without browning. *Cherries, loganberries.* Both maintained colour and flavour. *Economics.* The plant required is not expensive and should be set up in fruit-growing districts to deal with local surplus. About 5½ lb. of Czar produce 1 lb. of prunes and a packet of apple chips the size of a ¼ lb. tea packet contains the equivalent of 4 to 5 lb. of Bramley's. *Fruit powders.* Instead of sending windfalls to the market and depressing prices of better quality fruit it would be profitable to dry and reduce the fruit to powder. These fruit powders have a number of culinary uses and can be attractively made up for sale and would go far to solving the windfall problem.

1597. DENNY, F. E. 634.11: 664.85.11.047
Inactivation of the browning system in dried apples.
Contr. Boyce Thompson Inst., 1943, **13**: 57-63, bibl. 3.

In a previous article (*ibidem*, 1935, 7: 55-61) it was shown by the author that browning of cut apple tissue could be prevented by dipping the freshly cut pieces in 0·1% thiourea (NH_2CSNH_2). If dry products treated in this manner were soaked in an excess of water, however, the brown colour reappeared at once. In new experiments, conducted at the Boyce Thompson Institute, the browning system could be completely inactivated by heating the dried slices after treatment in thiourea solution in an oven at 80° C. for 1½ hours instead of in a current of warm air. The inactivation was found to result from the destruction of the peroxide component leaving the peroxidase constituent still active. If fresh apple tissue was rapidly reduced to a pulp, a dilution of 0·01 thiourea proved sufficient to prevent the development of brown colour. In this case also the peroxidase constituent was destroyed after heating the film of dried pulp at 80° C. for 1½ hours, the peroxide being inactivated even before heating. The explanation of the different effects of the treatment on apple slices and pulp is that thiourea comes in contact only with the surface cells of the slices, but acts more or less on the whole tissue of the pulp.

1598. CRUESS, W. V. 664.85.22.047
Prune dehydration experiments.
Fruit Prod. J., 1943, **22**: 324-5, 330.

Before describing his own experiments on prune dehydration, carried out at the University of California, the author discloses that more than half of the "sun-dried California prunes" are not sun-dried, but dehydrated, and that this process actually makes for better quality. Though disbelieved by dehydrator operators the investigations confirmed earlier findings that lye-dipped (sodium hydroxide) or steamed French prunes of various origins dried much more rapidly than untreated or hot water-dipped fruit. The steamed and lye-dipped fruit dried at about equal rates. A repetition of the experiment with large Imperial prunes had the same result for steamed fruit, whilst lye dipping did not shorten the drying time. It was found that relatively low humidity during drying at 150° F. prevented the Imperials from bleeding excessively. The author suggests that this variety should be dried by parallel current, finishing, if necessary, in a second tunnel by counter current. Moulding of Imperials could be controlled completely by sulphuring the prunes for 30 minutes before drying. Drying in an initial relative humidity of 26% and finishing in 10% was nearly twice as rapid as drying in humidities of 90%-40%.

1599. DAVIS, M. B., AND OTHERS. 664.84.047
Dehydration of vegetables in Canada.
Reprint Booklet from Food in Canada **3**, 1943, pp. 43.

The booklet contains 8 articles which have appeared in *Food in Canada* under the following titles: (1) Dehydration of fruits and vegetables in Canada—Preparation and pre-processing; (2) The mechanics of dehydration—The why and how of the use of heat and humidity in dehydrating vegetables; (3) Construction and operation of dehydrators; (4) Methods of dehydrating vegetables; (5) Packing methods for dehydrated vegetables; (6) Food value and keeping qualities of dehydrated vegetables; (7) A method for rapid determination of moisture in dehydrated foods; (8) A rapid control method for determining moisture in dehydrated potatoes. Many diagrams and photos amplify the detailed descriptions. This series of articles was prepared by members of the staff of the Experimental Farms Service, Dominion Department of Agriculture, supported by the Central Experimental Farm and the Stations at Kentville, N.S. and Summerland, B.C.

1600. KRUEGER, W. C. 664.84.047
Food preservation by drying.
Circ. N. Jersey agric. Exp. Stat. **463**, 1943, pp. 16.

Instructions are given for the drying of vegetables at home as well as for the construction and the operating of a dehydrator working with the incandescent lamp as source of heat.

1601. BEDFORD, C. L., DOBIE, J. B., AND SMITH, L. J. 664.84.047 +664.85.047
Home drying of fruits and vegetables with the W.S.C. dehydrator.
Pop. Bull. Wash. agric. Exp. Stat. **172**, 1943, pp. 20.

The construction of a W.S.C. dehydrator for home use at low cost and methods for drying many kinds of vegetables and fruits at home are described.

1602. WINTER, J. D., AND HUSTRULID, A. 664.85.047 + 664.84.047
Dehydrating fruits and vegetables at home.
Minn. Hort., 1943, **71**: 108-9, 112-3.
Notes are given on the domestic drying of various vegetables and fruits on the supposition that an electric dehydrator is available.

1603. FRIAR, H. F. 664.84.21.047
A problem in dehydration of new potatoes.
Fruit Prod. J., 1943, **22**: 339.
BLACK, H. G. 664.84.21.047
The effect of storage on Irish potatoes used for dehydration.
Fruit Prod. J., 1943, **22**: 370, 377.

1604. MULLEN, A. J. 663.25
South America's wine industry.
Foreign Commerce Weekly, June 12th, 1943, from reprint *Fruit Prod. J.*, 1943, **22**: 335-8, 349.
Argentine, Chile and Peru have devoted between them approximately 778,000 acres in the Andean foothills to grape growing, producing about 238,990,000 to 264,200,000 gallons of wine annually. Statistical figures are given pertaining to the wine industry in these countries.

1605. SINGH, L. 663.813 + 663.25
Scope for grape juice and grape wine industry in the Punjab.
Punjab Fruit J., 1943, **7**: 1271-5.
Introduction of large-scale vine growing as a basis for a wine and juice industry in the Punjab is advocated. At Lyallpur suitable varieties for wine and juice making have been selected which yield 8-20 seers per vine a year. The price of a gallon of wine, the quality thought to be up to European standard, would probably come to 1 or 2 rupees. The gain to the Province through large-scale grape wine and juice industry would be immense. The author points for support of his argument to the citrus squash industry, which was in its experimental stage only 12 years ago and has now become an economic factor.

1606. SINGH, L., LAL, G., AND ISHAQ, M. 663.813: 634.441
Preparation and preservation of mango squash.
Ind. Fmg, 1943, **4**: 81-4.
Since a large proportion of the mango crop is left to rot on the ground every year the preparation of mango squash was studied at the Fruit Products Laboratories, Lyallpur. Tables show the chemical composition of the squash which is said to be a delicious fruit drink, rich in vitamins A, B and C. The best squash was obtained by mixing equal parts of mango pulp, water and sugar and adding citric acid to raise the acidity to about 1%. The fruits going into the pulping machine have to be of uniform maturity. Potassium metabisulphite is the preservative recommended for processing. Detailed instructions are given for the manufacture of mango squash, the production cost of which is calculated to amount to about 2 annas per 24 oz. bottle.

1607. SIDDAPPA, G. S. 663.813: 634.64
Pomegranate juice.
Ind. Fmg, 1943, **4**: 196-8.
The preparation and bottling of pomegranate juice is described. Most suitable for extracting juice are the varieties grown at Kandahar in Afghanistan or at Gulistan in Baluchistan. Experiments conducted at the Fruit Canning and Preserving Research Laboratory, Quetta, showed that the juice can be converted into an excellent syrup, reminiscent of Sirop de Grenadine, by addition of sugar and citric acid. Experiments to improve the flavour still further are being continued. It is expected that a great demand for this product wil larise as soon as cost of production and price can be lowered, which will be achieved by using cheap split pomegranates for juice manufacture and by disposing of the by-products: the seeds for spicing and the tanning extracted from the rind.

1608. DATTA, S. C., AND BISWAS, S. C. 663.813: 661.731
Vinegar from sugarcane and fruit juices.
Ind. Fmg, 1942, **3**: 527-30.
The preparation of vinegar from native raw materials was studied at the Imperial Agricultural Research Institute, New Delhi. Percentages of sugar, alcohol and acetic acid are given for vinegar fermentation in the laboratory from sugarcane juice (16, 17, 18·2%), overripe banana juice, overripe jack-fruit juice, ripe jamun, 20% gur solution and 20% gur solution + ·1% ammonium phosphate.

1609. (CAMPDEN RESEARCH STATION.) 664.85.036.5 + 664.84.036.5
Research and experimental work.
A.R. Campden Fruit Vegetable Pres. Res. Stat. for 1942, 1943, pp. 9-11.
Notes on investigations in progress on the corrosion of tinplate and on the use of blackplate.

1610. ADAM, W. B. 577.16: 664.85.036.5 + 664.84.036.5
Factors affecting the vitamin C content of canned fruit and vegetables. Progress report II.*
A.R. Campden Fruit Vegetable Pres. Res. Stat. for 1942, 1943, pp. 12-7, bibl. 3.
The present report deals mainly with the effects of holding after preparation. It is found that there may be a slight loss of vitamin C in gooseberries if they are held for 4 hours after snibbing. Fresh peas and dwarf or runner beans may also show appreciable loss after podding or slicing. Peas and beans held at ordinary temperatures for 4 hours after blanching may show losses of 10-30% vitamin C. Within a range of 130-170° F. the temperature of closure of cans appears to have little effect on vitamin C content of fruit and vegetables. During the early stages of storage a slight fall in vitamin C content occurs in most canned fruit and vegetables, but subsequent rate of loss appears to be slow.

1611. ANON. 664.84/85.036.5 + 664.85.035.5
Wartime canning. Jams and jellies.
Publ. Canada Dep. Agric. **751** (*Household Bull.* **20**), 1943, pp. 15.
Detailed instructions for home canning of fruits and vegetables in Canada.

1612. VAUGHN, R. H., DOUGLAS, H. C., AND GILLILAND, J. R. 664.85.63.035.2.
Production of Spanish-type green olives.†
Bull. Calif. agric. Exp. Stat. **678**, 1943, pp. 1-82.
Consideration given to the production of Spanish-type green olives includes the industry in Spain as compared with the industry as it has developed in California; the technology of green olive pickling and an attempt to thoroughly explain the technical aspects of the fermentation. Bacteriological data are presented to show that the normal fermentation of green olives proceeds in three distinct stages. During the primary phase of fermentation many unrelated groups of gram-positive and gram-negative bacteria are found. The desirable lactic acid bacteria are in the minority. During the second or intermediate phase the *Leuconostoe mesenteroides* organisms gain the ascendancy. The final phase of fermentation is dominated by *Lactobacillus plantarum*, and the objectionable types disappear. The bacterial flora is affected by many factors including the variety and maturity of the olives, the concentration of salt in the brines, temperature of incubation and other factors. Yeasts are usually found in all fermentations during the early stages of fermentation and may persist. Data are presented to show the

* For I, see *ibidem for 1941*, pp. 14-20; *H.A.*, 13: 324.
† Taken from abstract kindly provided by the Editors of *Biological Abstracts*.

effect of control of fermentation on the rate of acid production in the olive brines. Control measures studied included the effect of pure culture inoculation, addition of supplementary fermentable material, acidification of the brine, and other factors influencing acid production in the brines of olives. The technical aspects of green olive pickling are enumerated and laboratory control of the fermentation is discussed in detail.

1613. DOERMANN, M. C. 664.84.035.2
Salting and brining of vegetables.
Circ. N. Jersey agric. Exp. Stat. **467**, 1943, pp. 8.
The preservation of vegetables at home by dry salting, weak brine and strong brine and the making of sauerkraut are described.

1614. BLUM, H. B., AND FABIAN, F. W. 633.85: 632.952
Spice oils and their components for controlling microbial surface growth.
Fruit Prod. J., 1943, **22**: 326-9, 347.
The effect of 32 spice essential oils and 7 components on *Saccharomyces ellipsoideus*, *S. cerevisiae*, *Mycoderma vini* and *Acetobacter aceti* was studied at the Michigan Agricultural Experiment Station, East Lansing, with the aim of controlling scum formation at the surface of fermented beverages and foods. With the exception of the most effective oil, mustard, where it was equal, emulsions of oils proved stronger germicides than the unemulsified oils. Free oil of clove, mustard and thyme and emulsions of a number of other oils were germicidal to *S. ellipsoideus* in 24 hours at a dilution of 1: 1,500. Cinnamon, cassia and clove oil ranked after mustard in effectiveness. The resistance of the organisms in decreasing order was *Acetobacter aceti*, *Saccharomyces ellipsoideus* and *S. cerevisiae* and *Mycoderma vini*. The data on the germicidal activity of spice components revealed the following order of effectiveness:—allyl isothiocyanate and carvacrol (equal), cinnamic aldehyde and cinnamyl acetate (equal), eugenol methyl ether and eucalyptol. Surface tension was not related to germicidal value. Some practical applications of these results are mentioned, namely: Addition of 2 drops of mustard oil or emulsion, or ground mustard added as a part of the spicing, to a sealed jar of pickles prevented scum formation on the top of the jar. The following procedure prevented formation of scum in barrels containing dill pickles. An emulsion of mustard oil—the free oil evaporated too rapidly—was placed in the centre of the false head in an open barrel which was then tightly covered. This expedient was effective for 2 weeks or more.

1615. SREERANGACHAR, H. B. 633.72-1.56
The nature of the tea oxidase system.
Curr. Sci., 1943, **12**: 185-6, bibl. 5.
Spectroscopic and manometric determinations, undertaken at the Indian Institute of Science and the Tea Research Institute, Talawakelle, Ceylon, proved that tea oxidase cannot be identified with cytochrome oxidase and resulted in a rejection of Robert's cytochrome theory of tea fermentation. The author's previous finding that tea oxidase is a polyphenol oxidase with an established specificity for 0-dihydric phenols is thought to offer a more satisfactory explanation of the tea fermentation process.

1616. RAPER, K. B. 577.154
The culture collection of the Northern Regional Research Laboratory, Peoria, Ill., U.S.A.
Chron. bot., 1943, 7: 340-1.
A large collection of micro-organisms is being assembled by the Bureau of Agricultural Chemistry and Engineering at the Northern Regional Research Laboratory, Peoria, Ill. The collection will eventually embrace all types of micro-organisms known to be significant in fermentation processes.

1617. WILKINS, E. G. 634.441: 581.192
Mango kernels as food.
Ind. Fmg, 1942, 3: 636-7.
Analysis figures of mango kernel flour are given and the value of mango kernels as a human food in times of want is affirmed.

1618. DICK, A. T. 633.88
The recovery of the glucoside aesculin from the Australian native plant *Bursaria spinosa*.
J. Coun. sci. industr. Res. Aust., 1943, **16**: 11-4, bibl. 6.
The leaves yield 4% to 5% aesculin. A possible source of local supply of this valuable glucoside for bacteriological and other purposes.

1619. ANON. 634.61-1.56
Ceylon coconut and coir industries.
Crown Colon., 1943, **13**: 803, 794-6.
Methods of coir extraction and preparation as well as the manufacture of desiccated coconut are described.

1620. ADAM, W. B., AND DICKINSON, D. 664.84.65.036.5: 581.192
Notes on the determination of solids and sugars in canned beans.
A.R. Campden Fruit Vegetable Pres. Res. Stat. for 1942, 1943, pp. 33-6, bibl. 1.
A technique is described and recommended.

WILSON, J. B. 663.2: 581.192
Determination of monochloracetic acid in wines.
J. Ass. off. agric. Chem. Wash., 1943, **26**: 477-8.

AMERINE, M. A., AND DIETRICH, W. C. 663.2: 581.192
Glycerol in wines.
J. Ass. off. agric. Chem. Wash., 1943, **26**: 408-13.

SREERANGACHAR, H. B. 633.72-1.56
Degradation of chlorophyll during tea fermentation.
Curr. Sci., 1943, **12**: 205-6, bibl. 3.

DOERMANN, M. 664.583
Pickles and relishes.
Circ. N. Jersey agric. Exp. Stat. **464**, 1943, pp. 8.
Recipes for the kitchen.

PATEL, C. B. 633.85
A note on the oil from the fruit of *Balanites roxburghi*.
Curr. Sci., 1943, **12**: 58.

FUCHS, W. 553.9
The possibilities of making coal and oil from plant materials of recent origin.
Chron. bot., 1942, 7: 247-9, bibl. 9.

NOTES ON BOOKS AND REPORTS.

1621. AINSWORTH, G. C., AND BISBY, G. R. 41.3: 582.8
A dictionary of the fungi.
The Imperial Mycological Institute, Kew, Surrey, 1943, pp. 359, 20s.
We are told in the foreword that this book was originally planned for university students. In its published form, however, it will probably be of even greater service to graduates in botany and to research workers in mycology. Plant pathologists in particular will find it a most useful book of reference, for they are frequently meeting with names and terms familiar no doubt to the systematic mycologists, but not in general use by others. The "Dictionary" comprises a list of all the generic names of fungi in use to the end of 1939, short accounts of families, orders and classes of fungi, a glossary of descriptive words and of other terms used in mycology, the common and scientific names of important fungi, and short biographies of noted

mycologists. The longer notes (½ to 4 pages each) are on such subjects as: Collection and preservation of fungi, edible fungi, poisonous fungi, entomogenous fungi, fairy rings, industrial mycology, medical fungi, methods (with formulae for some of the commonest media), mycorrhiza, nomenclature, plant pathogenic fungi, wood destroying fungi, etc. Such notes are followed by references to the relevant literature. G. W. Martin's "Key to the families of fungi" appears as an appendix. This is followed by 10 pages of figures (137 in all) illustrating terms mentioned in the glossary. The compilation has evidently been carried out thoroughly. There are, however, a few terms mentioned in the notes that are not described in the glossary, e.g. allergic (p. 191), allergy (pp. 171-2), and specific epithet (p. 202). Misprints appear to be few, but two in the text were noticed; fructicose (p. 161) should be fruticose), and *S. glandioli* should, of course, read *S. gladioli*. The descriptions have been written in Basic English with only a small number of non-Basic words. The book is one which should be ready at hand for all interested in fungi or in modern mycological research in all its branches. H.W.

1622. CHRISTENSEN, C. M. 635.8
Common edible mushrooms.
University of Minnesota Press, Minneapolis, 1943, pp. 124, 4 coloured plates and 62 illustrations from photographs, bibl. 23, 21s. or $2.50.

Certain kinds of food have become less plentiful since the outbreak of war and the public has become more interested in those plants of the hedgerow and field that serve as sources of food. Among these are the edible fungi, and the book under review reminds us that there are many fungi, other than the common mushroom, that may be cooked and eaten with safety and enjoyment. 47 edible kinds are described. 18 of these are shown in colour and others illustrated in the 67 excellent photographs. As a contrast and warning against indiscriminate collecting, several poisonous fungi are described and illustrated. The book is written primarily for American readers, but at least forty of the edible species mentioned are common in the British Isles. Those who are interested in the edible fungi of Britain have probably already secured copies of Bulletin No. 23 (price 2s. 6d.) of the Ministry of Agriculture, "Edible and poisonous fungi", in which 17 edible kinds are described and figured, including 8 not mentioned in Professor Christensen's book. For those then who would look farther afield the more expensive book will serve as a guide to the identification of other species, and the enthusiast will doubtless get his money's worth. Some of the fungi are mentioned as "eminently edible", "delicious", "edible and delectable", etc., though others are "edible but tough". One chapter headed "The foolproof four" describes morels, puffballs, the sulphur shelf mushroom (*Polyporus sulphureus*) and shaggymane (*Coprinus comatus*). The mycologist may be surprised to find the ascomycetes *Morchella*, *Helvella*, and *Gyromitra* described in a chapter coming between those dealing with puffballs and the pore fungi. The last chapter dealing with mushroom cooking gives a number of general recipes, and special recipes for cooking certain species. One drawback (in common with the bulletin mentioned) for a book of this kind is that its format renders it rather too large for the pocket. H.W.

1623. OGDEN, C. K. 4.089.4
Basic for science.
Kegan Paul, Trench, Trubner & Co., London, Psyche Miniature Series, 1942, pp. 314, 2s. 6d.

This booklet contains a review of how Basic originated and its progress into the limelight and how it can be used in actual practice. Most of the publication consists, however, in Basic readings for the general and for the expert reader. These are either originals or Basic versions of articles (mainly English) on particular subjects. The average reader, whose scanty knowledge of Basic is likely to be derived solely from the somewhat acrimonious discussions in the press, will be amazed by the smoothness of the narrative. An irreverent abstractor suggests that the articles remind him of his own attempts to disguise authors' summaries, but even if that is so, at least they indicate that Basic can express clearly, briefly and without offence to the ear ideas which are ordinarily expressed in English or other languages by the use of a larger number of different words. A dictionary of Basic and of Basic scientific terms and a list of international words is included.

1624. SCHOPFER, W. H. 577.16: 581.14
*Plants and vitamins.**
Chronica Botanica Co., Waltham, Mass., Wm. Dawson & Sons Ltd., London, 1943, pp. xvi + 300, $4.75.

This book deals with the vitamin requirements of plants (including bacteria and flagellates) and with the formation and functions of vitamins in plants. The major part of the book is devoted to the vitamin requirements of bacteria; yeasts and other fungi take second place; and at present relatively little work has been done on the algae and higher plants, though certain of the vitamin requirements of isolated embryos and roots are fairly well known. Other subjects touched upon include plant tissue culture, hormones, sexual substances, symbiosis, metabiosis, parasitism and artificial *versus* natural fertilizers. A review of this type is particularly valuable where, as in this case, the research work has been confined to a small number of laboratories and is little known to workers in related fields; it opens up many vistas of investigation into fundamental biological questions. Since the work has been so recent—few of the papers cited antedate 1933—it is necessarily in the nature of a progress report, and certain parts of the book suffer in ease of reading and construction from this fact. The author is at some pains to develop a satisfactory definition of vitamins which will distinguish them from organic "micronutrients" and hormones; he even specifies that they all function "as coenzymes or fragments of coenzymes" and "are concerned with assimilation". The validity of such generalizations may be doubted; and labour in this direction of classification is probably ill-spent in the present stage of development of the subject. The author claims that the literature of the subject has been reviewed more or less completely up to 1941; in addition, about 30 references (out of some 600) are to work published in 1942. Unfortunately references to a minority of the papers cited are not given. If the bibliographies at the end of each chapter were condensed into a single bibliography at the end of the book, a considerable number of duplications could have been avoided, and space made available to complete it; this arrangement would also facilitate the use of the book for reference purposes. Another criticism concerns the lack of consistency in nomenclature; the book would be easier to read if, after the statement of synonyms in Chapter V, a single term for each substance were adopted and used throughout. Dr. N. L. Noecker is responsible for a capable translation, and has shown the translator's virtue of self-effacement. Apart from the rather crude illustrations, the book is very well produced, and is completed by excellent author and subject indexes. D.W.G.

1625. HARRIS, D. 635.1/7: 631.531
Vegetable seeds.
Faber & Faber, London, 1943, pp. 52, 3s. 6d.

This attractively illustrated little book provides for the ordinary man with a garden† information on the way in which he can raise his own seed of the following vegetables:—Peas and beans, lettuce, onions and leeks, beetroot, carrot

* Authorized translation by N. L. Noecker.

† The commercial grower should see "The production of seed of root crops and vegetables", *Joint Publication Imperial Agricultural Bureaux*, No. 5, 3s., obtainable from I.A.B. Central Sales, Penglais, Aberystwyth.

and parsnips, tomatoes, marrows and the brassicas. In addition hints are given on the saving and use of potato "seed" and on seed cleaning. The instructions are not intended for the commercial grower and many of the refinements suggested can necessarily only apply to small scale production where individual plants can receive attention. This fact does not detract from their value to the private individual.

1626. MOORE, H. I. 633
Crops and cropping.
George Allen & Unwin, London, 1943, 8vo, pp. 259, figs. 59, 12s. 6d.

The information here offered is derived from the author's* advisory and research work and from the bulletins of the Ministry of Agriculture and various research stations and is in agreement with the most recent findings of research. An introductory chapter covers the general principles of crop production and includes notes on rotations, manuring, selection and treatment of seed. Subsequent chapters are concerned with the cultivation of individuals of the following groups of crops:—grain, forage, root crops for sale, root crops for feeding, and miscellaneous crops including linseed, flax, buckwheat, mustard, lupin, onion, grass and clover seed.

The final chapter deals particularly with the cropping problems which are of immediate urgency in the United Kingdom. They include the cropping of newly broken grassland, fertilizer economy, treatment of derelict land, the use of straw pulp for food, cropping for milk, cropping to meet labour shortage, catch cropping.

The illustrations, most of which portray technical practice, are exceptionally clear and helpful.

Appendixes 1-6 give information on the following points:—(1) addresses of advisory centres in England and Wales; (2 and 3) keys for diagnosing (*a*) pests and (*b*) diseases of the common farm crops; (4) time and rate of sowing and average yield of common farm crops in England; (5) operations' calendar for catch and forage crops; (6) phosphatic and potassic fertilizer conversion table showing the amounts of P_2O_5 and K_2O in particular fertilizers.

1627. CROWELL, I. H., AND LAVALEE, E.
632.3+632.4+632.8
Check list of diseases of economic plants in Canada.
Mimeographed by courtesy of the Dominion of Canada Department of Agriculture, Science Service, 1943, pp. 68.

This mimeographed check list is "a compilation of data which have been accumulated for many years in the literature and in the notes and records of many Canadian plant pathologists". The diseases are grouped under their host plants which are arranged alphabetically according to their Latin designation (followed by their common names in English and French). Each disease is headed by the name of its cause, to which are added its English and French common names and its distribution. There are two indexes, of the English and French common names of hosts respectively. In a few years it is proposed to call in the distributed and annotated copies of the present list, when it is hoped to present a further revision in a more permanent form. R.V.H.

1628. INTERNATIONAL INSTITUTE OF AGRICULTURE (COSTA, M.). 634.63
Olives and olive products.
Studies of the principal agricultural products on the world market **6**, 1940, Rome, pp. 223, bibl. 146, $1.30 or 25 liras.

This work contains an account, for each of the 27 countries in which olives are grown, of the area under olives, number of trees, production of olives for oil extraction and of table olives, the production of edible and inedible oil and yields, together with information on world trade in oil and olives. Though mainly statistical it contains details of varieties cultivated, nature of soils, amount of rainfall, etc. The density of the olive population is clearly shown in maps of the countries concerned. A very good idea of the importance of the olive in the countries is also given in the text, each country being dealt with separately. Spain is by far the greatest producer of olive oil with a total of 41·5% of world supplies. She is followed by Italy with 24·0%, Greece 12%, Portugal and Tunis 6% each and Turkey 3%. Between 1930 and 1940 considerable increases occurred in production in Syria and Lebanon and in Cyprus.

1629. ANNUAL REVIEWS INC. 581.19
Annual Review of Biochemistry.
Vol. 12, 1943, pp. 704. Annual Reviews, Inc., Stanford University P.O., California.

Reviews are included of work on the following subjects, all of which are of fundamental interest to the horticultural research worker:—Photosynthesis (pp. 473-92, bibl. 85), mineral nutrition of plants (pp. 493-528, *see abstract* 1131) the electron microscope (pp. 587-614, bibl. 140), the chemistry of viruses (pp. 615-38, bibl. 146), microchemistry (pp. 639-60, bibl. 166).

1630. C.S.I.R., AUSTRALIA. 634/635+664.84/85(94)
Sixteenth Annual Report of the Council for Scientific & Industrial Research, Australia, for 1941-42, 1943, pp. 74, 3s. 3d.

Plant Investigations. Weeds:—Experiments are reported on nutgrass (*Cyperus rotundus*), galvanized burr (*Bassia birchii*), Berkhaya thistle, hoary cress (*Lepidium draba*), common reed (*Phragmites communis*) and St. John's wort (*Hypericum perforatum*). Fruit:—(1) Apples:—(*a*) in Tasmania. The new laboratory at Huonville proves very valuable. Long term problems have in the main yielded place to those of greater immediate urgency. Injection experiments indicate that decline in apple trees is due to soil management factors aggravated by a succession of dry seasons rather than to any particular mineral deficiency. Fruit from apple varieties on Malling VII showed in store the lowest susceptibility to pit and breakdown and those on Malling II the highest susceptibility, those from trees on other stocks being intermediate. The fruit from hard pruned was larger than that from lightly pruned trees and more susceptible to storage disorders. Successful semi-commercial scale trials were completed on the coating of Sturmers in cool and common store, there being little to choose between the good effects of the castor oil-shellac-alcohol bath and other emulsions. Treatment retarded colour change and reduced shrivelling and Jonathan spot. The undesirability of using over-mature fruit was emphasized. A full-scale trial was in progress in the 1942 season. Apples:—(*b*) at Stanthorpe. Rootstock trials on Northern Spy, two local stocks and Merton 789 and 793 continue and are beginning to yield encouraging results. (2) Citrus investigations at the Griffith Research Station continue on rootstocks, shoot and root growth and minor element deficiencies. Drug plants:—Analysis and testing of material and research on methods of extraction concern the following drug plants:—Corkwood tree (*Duboisia myoporoides*), deadly nightshade (*Atropa belladonna*) and henbane (*Hyoscyamus niger*), foxglove (*Digitalis purpurea* and *D. lanata*), poppy (*Papaver somniferum*), *Ephedra* spp., plants producing quinine, strychnine, emetine and strophanthin, *Dryopteris filix-mas*, *Artemisia*. Small lots of squill (*Urginea scilla*), buchu (*Barosma* spp.), *Colchicum autumnale*, dill, aniseed, angelica, coriander and grindelia have been raised for propagation purposes. The bark of *Alstonia constricta* has been used as a substitute for imported gentian. Tobacco:—Yellow dwarf and quality. Vegetable fibres:—Flax, jute and *Urena lobata* are under investigation. Potatoes:—A cheap commercial

* Lecturer in agriculture to the University of Leeds, and Cropping Officer to the West Riding of Yorkshire War Agricultural Committee.

method of breaking dormancy consisting of the use of aqueous solutions of acetylene has proved satisfactory. Virus work continues. Seed trials:—Vernalized lettuce seed produced seed stalks 2 to 3 weeks earlier than the controls. *Entomological Investigations.* Methylallyl chloride has proved very valuable as a fumigant for seed wheat. Work is in progress on the insect control of St. John's wort and of lantana, of the cabbage butterfly and of the green vegetable bug (*Nezara viridula*). A study is being made of the insect vectors of tobacco yellow dwarf and of potato viruses. *Irrigation Settlement Investigations.* (*a*) at Merbein. Viticulture:—Fertilizers and cultural operations are being investigated. Fruit processing:—It has been found possible to substitute cotton seed oil for olive oil for use in dipping sultanas. (*b*) at Griffith. Work at the Irrigation Station, Griffith, includes orchard surveys, soil deterioration problems in the orchard, soil management in orange groves, irrigation methods for vegetables. *Food Preservation Investigations.* Trials include: Canning of vegetables with special attention to the retention of vitamin C and to increasing the weight of vegetables per pack; drying of vegetables and storage of the dried product; mould wastage in apples; many fruit storage problems such as (1) at Sydney:—Wax coatings for apples derived from solutions of castor oil and dewaxed shellac in alcohol, emulsions of paraffin wax and sugarcane wax, etc.; storage of Packham, Bosc and Winter Cole pears; the natural waxy coating of Granny Smith apples; (2) at Melbourne:—Apple storage in air and gas mixtures, as also the waxing of apples, pears, peaches, plums and oranges, and lemon sweating; attempts to find a satisfactory substitute for the cork previously used for packing grapes—rice hulls show some promise. Fruit products work is devoted to the preparation of fruit concentrates, citrus juice and apple juice, using the gelatin-tannin method of clarification. Rose hips and blackcurrants are also being considered. The Physics Section has investigated wrapping and packing materials, the wilting of fruits and dehydration problems.

1631. East Malling Research Station. 634.1/7
Annual Report of the East Malling Research Station for 1942, A26, 1943, pp. 112.

The report is divided into 4 main sections:—(1) The experimental farm, (2) General review of research work with lists of papers published, (3) Research reports and (4) Bulletins for fruitgrowers. Abstracts are given of articles in sections 3 and 4.

1632. Hawaii. 63: 551.566.1(969)
Report of the Hawaii Agricultural Experiment Station for the biennium ending June 30, 1942, 1943, pp. 148.

Among projects of the different departments briefly touched on here are the following. *Zinc.* A study of the zinc content of pineapple plants and soils in relation to zinc deficiency symptoms observed in the field led to a discovery of a relationship between the degree of zinc deficiency exhibited by the plants and the available soil zinc. Zinc in the plant was found in greatest amounts in the meristematic tissues, and its concentration there formed the only critical index related to the deficiency symptoms. Abnormalities curable by spraying with zinc sulphate result directly from a soil deficiency in zinc. *Boron.* Points considered were: availability of water-soluble boron in Hawaian soils, boron fixation and the distribution of boron in 3 agricultural crops. In pineapple the older leaf tissue, the leaf tips, showed the highest concentration of boron and the most marked decrease in concentration from the normal because of the low amounts of water-soluble soil boron; in coffee the boron accumulated in the older leaves; in sugar cane in the meristem, elongating cane and leaf blades, concentrations being relatively low. *Translocation.* In the sausage tree (*Kigelia pinnata*) movement was at its peak during the first 5 weeks indicating that the movement of sugars in the plant is a process involving metabolic work on the part of the sieve-tube protoplasm of the phloem. *Toxicology.* Increasing the amount of phosphate in a nutrient solution materially reduced the absorption of pentavalent arsenic by bean, Sudan grass and tomato but had no effect on the absorption of trivalent arsenic. In soil phosphate did not reduce the absorption of arsenic. *Seed studies.* Germination of *Leucaena glauca*, usually low, could be increased only by treatments which altered the nature of the impervious seed coat, such as scarification, soaking in a 52% solution of sulphuric acid for 1 to 2 hours, or, rather less effectively, by soaking in water heated to 80° C. and allowed to cool after receiving the seeds. In Hawaii seed storage is only effective when the relative humidity can be maintained below 45%. Commercial grades of calcium chloride or quicklime at the bottom of the airtight container but not touching the seeds will produce the requisite atmospheric dryness. *Fruits and nuts. Macadamia.* Successful grafting depends on the amount of starch stored in the scion. This can be stimulated by ringing the branch intended for scion wood. The time required for adequate accumulation varies from 2 to 8 weeks. Testing for starch by the iodine method on small excised portions of the branch is recommended. Fallen nuts germinate quickly with rapid depletion of oil reserves. Prompt collection is necessary to preserve quality. *Papaya.* Data are provided on inbred lines, inheritance studies, accessions and selections. Carpellody or the tendency of the stamens to assume the structure and functions of carpels, which may be fused in various degrees with the main pistil, resulting in malformed fruit, is under investigation. Colchicine-induced polyploid trees are the subject of experiment in relation to breeding work. Long photoperiod, 18 hours, favoured the production of staminate flower parts and the suppression of pistillate flower parts, though some trees continued to fruit and produced continuously fertile hermaphrodite progeny. Bordeaux mixture sprays severely injured fruit and foliage; cuprous oxide or sulphur in normal doses did not. Anthracnose (*Colletotrichum* spp.) only appeared on immature fruits sprayed against fruit fly with methyl bromide and on fruits kept in anaerobic conditions for several days. Chloropicrin applied to the soil at the rate of 6 c.c. per cu. ft. controlled damping off (*Rhizoctonia* sp. and *Pythium aphanidermatum*) on papaya seedlings but did not prevent subsequent infection. Methyl-bromide fumigation for papaya for export retarded rate of ripening and increased decay in firm ripe and mature green fruit. It is not recommended. Waxing was successful in reducing water loss during storage and ripening. Quality in papaya fruit appears to be positively correlated with sugar content. High sugar values obtained on the trees with a large number of leaves in relation to fruits. *Coffee.* Results of leaf analysis of coffee from a number of localities over a period of 18 months are summarised. Potash content (2% to 2·5% dry basis) gradually decreases with age of leaf and the decrease is not much affected by fertilizer applications. Dieback usually occurs with high yields and when potash content falls below 1·5% during autumn. Heavy applications of complete fertilizer in spring have sometimes checked dieback despite heavy crops. It appears to be definitely associated with potash deficiency. The optimum range for total nitrogen in coffee leaves is 2·5-2·0% (dry basis). The leaf content is increased by nitrogen fertilizers and following a dry period. Dark green colour indicates high nitrogen content. The highest amount of nitrate nitrogen (0·03 to 0·10%) was found in leaves 2 to 10 months old. Carbohydrate accumulation was highest in the winter dry season and at high elevations and declined sharply with spring growth. *Tomatoes.* Methyl bromide fumigation as in papaya increased decay and delayed ripening. Waxing reduced shrivelling. Notes are given on new mango introductions and quick freezing for mangos, and on variety collections of litchi and longan and avocado. *Citrus.* Vigorous shaddock and sour orange are the stocks to be used in the variety and cultural orchard being built up

at Poamoho. There are notes on a number of vegetable crops. Size of seed piece had an important effect on yield of potato in favour of the larger (3 oz.) pieces. Dipping cut potatoes in ethylene chlorohydrin broke the dormant period successfully under irrigation.

1633. D.S.I.R. New Zealand. 633/635(931)
Seventeenth Annual Report of the Department of Scientific and Industrial Research, New Zealand, for 1942-43, 1943, pp. 44, 1s.

Fruit cold storage. Maturity of fruit at harvesting is found to be a factor of vital significance in the storage of Jonathan apples. Investigations indicate that the use of oiled wraps, immediate storage and avoidance of early picking are the best means of ensuring the successful storage of Granny Smith apples. Unbalanced nitrogenous manuring tends to produce breakdown in Cox's Orange, Dunn's Favourite, Jonathan and Sturmer apples in cold storage but to have no such effect on Delicious. Ripe spot of stored apples (*Neofabraea malicorticis*) tended to be less where lime-sulphur was used as a fungicidal summer spray or bordeaux in the late summer. Other fungous diseases were not affected by treatment. The use of waxed paper liners to control wilt proved economic for Coles and Winter Nelis pears. Orchard storage tests with 7 varieties of apple are reported.

Fruit Research. 1. Apples. Long term manurial trials are in progress at Appleby and at Mildura Orchard, Upper Moutere. A method has been stabilized by the Cawthron Institute for making colorimetric tests on the ash skeleton of apple leaves. Success is reported in the control of magnesium deficiency by magnesium sulphate and by dolomite. Comparisons are made of the growth and yields of apples on Northern Spy compared with those on Malling types XII, XV and I. The Cawthron is trying to establish the codling moth parasite, *Ephialtes caudata*. 2. Stone fruits. Peach variety trials and attempts to control *Bacterium pruni* of plums are in progress. 3. Small fruits. Control measures for pests and diseases are being worked out. 4. Citrus. Trials of rootstocks for Washington Navel orange and Lisbon lemon and variety trials of sweet orange, mandarin and grapefruit are in being. The mycorrhiza associated with the roots of citrus is being investigated to determine its relation to tree vigour and cropping.

Plant Chemistry Laboratory. Vegetable dehydration is receiving much attention, particularly the problem of retention of vitamins in the dried product.

Botany Division, Wellington. The problems of seaweed utilization are under investigation. Reports are made of experiments on the growth and analysis of the following medicinal plants:—*Digitalis purpurea, D. lanata, Atropa belladonna, Datura stramonium, Hyoscyamus niger, Papaver somniferum* and others. Rubber plants under trial are kok saghyz and native sowthistle (*Sonchus littoralis*). Fibre work embraces phormium, hemp, flax and a number of plants tested for fibrous plaster.

Entomology Division, Nelson. Reports are presented of work including that on the diamond back moth (*Plutella maculi pennis*), white butterfly (*Pieris rapae*), tobacco store insects, possible pests of flax.

Plant Diseases Division. Owairaka, Auckland. Work is reported on the control of flax and seeding swede diseases, potato late blight and a number of other diseases and on the life history of the carrot rust fly (*Psila rosae*) and of the vegetable weevil (*Listroderes obliquus*).

Tobacco Research. Reports refer to fertilizer experiments, seedbed work and mosaic and other diseases.

1634. Viljoen, P. R. (S. Africa). 633/635(68.01)
Report of the Department of Agriculture and Forestry and Food Control Organization for the year ended 31 August 1942.
Fmg S. Afr., 1942, **18**: 1-45, 56, 79-100.

In the absence of the regular Annual Report a summary is given of the work done in connexion with the most important agricultural and food control matters, chiefly in relation to conditions brought about by the war. Horticultural research receives only brief mention, chiefly in respect of citrus and vegetable pests and diseases.

1635. Tanganyika Territory. 633.73(678.2/9)
Ninth Annual Report Coffee Research and Experimental Station, Lyamungu, Moshi, 1942, 1943, pp. 9, 1s. 6d.

Seven thousand cuttings of coffee have been successfully rooted for use in clonal selection trials. The benefit from preparing holes some time in advance of planting, allowing time for the soil to settle and planting at nursery level is maintained over the five-year period. Sub-soiling the hole or the inclusion of compost showed no advantage. Plots converted to multiple stem by (1) cutting off west side primaries, leaving 3 suckers from bottom, (2) cutting off east side primaries, leaving 3 suckers from bottom, (3) cutting off all except top 3 primaries, 3 suckers from bottom, yielded significantly better than (1) clean stumping, leaving 3 suckers from bottom or (2) agobiada, multiple stem, 3 suckers. Top cut at 3 ft. from ground and 3 suckers left to grow at top were not significant. These results are thus the same in the third year of conversion as in the first but with smaller differences. Significant results were not obtained in the cultivation experiment over 5 years comparing forked hoe, West Indian hoe, envelope forking, trenching and nil. Over 5 years the selection of the best nursery seedlings has resulted in the highest yield. Multiple stem coffee has again heavily outyielded single stem and agobiada. In mulching experiments the superiority of banana trash and of Guinea grass is maintained over elephant grass, weeds as mulch and clean weeding. Many other experiments are temporarily in abeyance.

1636. Uganda. 63: 551.566.1(676.1)
Annual Report of the Department of Agriculture, Uganda for the period 1st July, 1941, to 30th June, 1942, 1943, pp. 10, 1s.

The brief report of the activities of the Agricultural Department is chiefly concerned with large-scale production for export of various commodities, chiefly foodstuffs, required for the war effort. A few results of experiments are mentioned. *Arabica coffee.* At Bugusege the appearance of the crops under shade was outstanding; in the West Nile District, judging by appearance only, shade is needed. Modified multiple stem trees gave a record yield, but the unlimited terminal growth trees suffered severely from die-back. *Robusta coffee.* Full elephant grass mulch had a depressing effect on growth and yield. Although shaded coffee has the better appearance it seems preferable not to shade. Manuring with cotton seed, particularly under shade, gave a considerable return. *Gliricidia* as a shade tree has a bad growth habit and is susceptible to mealy bug and root disease. It is being replaced by the bark-cloth *Ficus*. At Kawanda there were no failures under banana shade whereas bushes in the open showed the effects of the prevailing dry wind. Parasitism of *Antestia* by *Epineura* was increasing but repeated cultivation of the ground eventually destroyed many parasite pupae. The parasite *Corioxenos* increased to 30% and though considerably reducing the *Antestia* population did not prevent appreciable damage. *Cassava.* A study has been started on mosaic in relation to sowing date. *Cinchona.* Seed from selected and unselected trees was planted in 1942 to provide seedlings for distribution in 1943.

1637. West Virginia (Orton, C. R.). 634/635(754)
Epistle to the farm.
Report of the Director West Virginia Agricultural Experiment Station for the Biennium 1940-1942, 1943, being *Bull.* 307, pp. 56.

A popular account of work in progress in the different departments. No experimental data are given. *Farm*

crops. Wilt resistant strains of water melon are being evolved. *Fruits and vegetables*. Work is in progress on the best combinations of apple rootstock and scion for different conditions, on green manuring to supply nitrogen, on sod *versus* cultivation in the apple orchard, on mulching and spacing of small fruits on blueberry selection, on green manuring for vegetables, on topping tomatoes. *Plant disease and insect control*. The control of disease, using less copper, is being studied. Apple measles, an internal necrosis of apple, is found not to be due to boron deficiency. Codling moth investigations point to the fact that the moth hibernates in the tree tops in numbers sufficient to re-establish populations the following spring. Some workers suggest that the pest might be starved out by allowing trees to bear no fruit at all in any one year. *Forestry*. Neither apples, potatoes nor tomatoes will thrive in the vicinity of the black walnut.

1638.

The following Annual Reports and other publications have also been examined:—

A.R. agric. Dep. Dominica 1942, 1943, pp. 7.

Rep. Dep. Agric. British Guiana for 1942, 1943, pp. 10.

Rep. Dep. Agric. St. Lucia, B.W.I., 1942, 1943, pp. 15, 6d.

A.R. Dep. Agric. Tanganyika Territory, 1942, 1943, pp. 7.

AMERICAN SOCIETY OF PLANT PHYSIOLOGISTS. 581.1

Directory of members of the American Society of Plant Physiologists.

Plant Physiol., 1943, Vol. **18** No. 3, *suppl. Bull.* **14**, pp. 29.